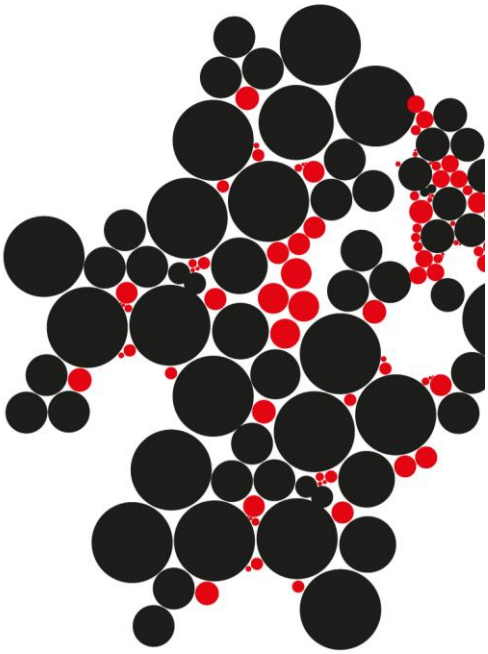
MASTER THESIS



TOWARDS AN UNDERSTANDING OF SUCCESS DIMENSIONS IN DESIGN THINKING EDUCATION

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Towards an understanding of success dimensions in Design Thinking education

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Abstract

Ideation and innovation processes have become a cornerstone for the competitiveness of organisations. Design Thinking is one promising way to extend the creative potential of both students and professionals. Interdisciplinary teams solving complex challenges in open innovation spaces are the specialty of Design Thinking. The HPI School of Design Thinking in Potsdam, Germany, offers education programmes for students and professionals to become proficient in the process and methods.

This thesis focuses on the question of how the current student education programme in Potsdam can be evaluated. Previous research in this area mainly focused on professional contexts. As no formal accreditation seems suitable for the student programme, a congeneric literature review suggested 4 success dimensions: motivation and understanding, learning goals, learning experience and facilitation, success perception and personal development. In a qualitative and explorative format, 13 interviewees (applicants, students, coaches and staff members) were invited for in-depth interviews.

Team work is perceived as most relevant for the education programme and is understood as collaborative and innovative problem solving among team members from diverse backgrounds. Students perceive the programme as successful when they learn how to work and manage interdisciplinary teams (team-level), how to develop their creative confidence (personal-level) and how to apply Design Thinking for future projects (content-level). Several important success elements for each success dimension were derived, providing the base for the development of quantitative or qualitative evaluation measures capturing the overall programme. Extensive descriptions of the rich results provide a current state of the Design Thinking programme and suggest future improvement areas. In making implicit knowledge of the d.school available to the academic society, researchers and individuals outside this subject area can gain a deeper understanding of the Design Thinking programme.

Quotation formatting

This thesis and its qualitative nature necessitated arrangements to sustain a constant reading experience and flow. The interviews were transcribed and received a two-character code (e.g. HN, 14) that is used throughout this thesis to reference quotations and citations. The two-character code is followed by a number indicating the paragraph in which the interviewee mentioned this aspect in the transcript. In quotations, [...] is used to indicate left-outs. Text within [these brackets] indicates a notation or addition that was made by the author.

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Part I.

Design Thinking introduction and research design

1. Design Thinking to meet increasing complexity

1.1. The advent of Design Thinking student education

> Everyone loves an innovation, 'an idea that sells.' Unfortunately, this is an outcome, not a process for achieving the goal. (Plattner et al., 2010, p. xiii)

The outcomes of innovation processes, i.e. innovations, have become a cornerstone for the competitiveness of organisations, yet many organisations still struggle in staying competitive. Even companies that were known to be well-managed and formerly innovative became suddenly obsolete (e.g. Nokia or Kodak), indicating that not only innovation itself but also the method and process how it is implemented are important (Christensen, 1997). Innovation challenges often seem to be the trial of squaring a circle and an extensive body of research has outlined the importance for education organisations like universities to help students in facilitating their innovative potential to be able to "solve messy, unstructured problems that don't have easy answers" (Steinbeck, 2011, p. 27). These challenges occur especially in today's economies characterised by an increasing competitive pressure and globalisation (cf. Thiel and Masters, 2014).

One promising way to extend the innovative potential of students and professionals has been developed at the Design School (in short d.school) at the University of Stanford, USA, and the HPI School of Design Thinking at the University of Potsdam, Germany – namely the Design Thinking education. Acknowledging that technology and business domains are sufficiently considered in corporate problem-solving and innovation processes, the element of user-centeredness, i.e. the human values, was lacking necessary attention (Brown, 2008). With successes like inventing the computer mouse or the design of the Lisa computer, the computer that shall later become the Macintosh, Design Thinking became renowned as a meta-disciplinary and "holistic concept to design cognition and design learning that enables students to work successfully in multi-disciplinary teams and enact positive, design-led change in the world" (Rauth et al., 2010, p. 2).

The educational paradigm of the Stanford and Potsdam based Design Thinking education is guided by the principle that teaching problem solving skills beyond scientific thinking demands for an "education without theory lessons" (Lindberg et al., 2011, p. 14). In practice, this means that the study program is highly characterised by self-oriented and guided learning. Interdisciplinary and international student teams shall work with a maximum of creative freedom in a flexible surrounding, yet they are currently guided throughout the iterative process by coaches (Noweski

et al., 2012). As the authors describe, "there should be an emotional distance between the team member and coach, while at the same time sufficient closeness to always know when intervention is needed" (ib., p. 79). The bootcamp bootleg d.school (2011) and Plattner et al. (2010, 2012b,a) outlined that teams usually consist of five to seven members with a diverse background (regarding e.g. study field, nationality, professional backgrounds). These teams get assigned design challenges, i.e. specific research or project questions that are framed in an open and inspiring format. Challenges include a brief description of a current situation and frame the space in which teams are asked to proceed. The goal of the design education is hereby twofold: On the one hand, challenges are assigned to project partners (e.g. companies, research institutes, and social organisations) and teams strive to improve the pain points of their project partners with user-tested as well as iteratively substantiated prototypes and concepts. On the other hand, team members are assisted in their individual and joint learning journey by two coaches that are alternatingly available.

Design Thinking has received an increasing attention in research, in particular through the Hasso Plattner Design Thinking Research Program (HPDTRP), a joint research programme between the University of Stanford and the Hasso Plattner Institute in Potsdam. This research programme focuses on different aspects of Design Thinking. It aims at substantiating the Design Thinking practices on an academic level as well as to connect Design Thinking with the research in congeneric field like general innovation management research. This research programme is also an important source for the regular Design Thinking series published with different foci (Plattner et al., 2010, 2012b,a, 2014, 2016).

1.2. Research context

1.2.1. Research problem

This thesis began with the question of how the current Design Thinking education programme in Potsdam could be evaluated. In order to improve an existing programme or process, one needs an understanding of where one is standing at the moment. This "line in the sand" is necessary to understand how any change that is going to be made affects this initial situation and also which factors are promising or interesting to look at.

The Design Thinking education programme in Potsdam is not accredited by an external organisation due to its flexible and out-of-the box nature. As there is no grading present, no examinations are taking place, thus no grading process is behind this programme, and the programme does not lead to a formal degree at the end like a Bachelor title, accreditations from classic university programme accreditation agencies do not directly apply to the Design Thinking education programme. Even more, without any intention to be presumptuous, the directors and track managers of the d.school want to have a very strong flexibility on how they design and adapt the programme from term to term. As the programme structure itself is iterated as well, traditional accreditations would not only induce high organisational efforts but would also be likely to have a short half-life

period. Thus different evaluation criteria are necessary and it cannot even be assumed that these criteria can be quantitatively assessed at this stage.

In order to improve the Design Thinking student education programme - and to develop qualitative, quantitative or mixed evaluation measures for the Design Thinking education programme - it is thus necessary to first identify and understand success dimensions that are likely to be relevant for the Design Thinking education success. Because there is no previous research available with an indication of probable success dimensions, this study is carried out qualitatively and explorative with in-depth interviews.

1.2.2. Research objective

There is a multitude of studies available on the topic of success factors for team innovation (in professional context) or team effectiveness (again, mostly in professional context). These professional contexts differ substantially from the education context of the d.school in Potsdam. As in professional contexts the main motivation is to generate turnover, ensure the organisations future and to increase shareholder value, the motivation at the d.school lies in educating students to train their creative confidence and develop a higher self-efficacy. With its focus on team process and team experience rather than directing them towards a predetermined knowledge and learning framework, the d.school also differs from classic university contexts that still tend to promote and are characterised by a standardised education format.

Thus success dimensions in professional contexts (and largely also in academic contexts) do not seem to apply for the Design Thinking education programme. To be able to research educational aspects (e.g. the format or the teaching method) of Design Thinking it is necessary to have an understanding of success dimensions for Design Thinking education. These overall success dimensions can function as a „line in the sand“ for future Design Thinking education research.

Accordingly, this descriptive, qualitative and explorative research study provides a first understanding of success dimensions in the Design Thinking education at the HPI School of Design Thinking in Potsdam.

1.2.3. Research motivation

This study needs to be conducted because there has been no research so far on how the Design Thinking student education programme could be evaluated. This study aims to provide a description of which success dimensions are perceived as important by students and staff members. It hereby provides an insight into the core of Design Thinking education and allows future researchers to carry out research e.g. on defining a survey measure or on the improvement of Design Thinking education.

2. Theoretical background

2.1. Design and the Design Thinking discourse

When a new term is becoming viral, especially the academic world needs to become cautious. Design Thinking as a new way to approaching seemingly unsolvable or highly complex multi-dimensional problems has received such a notion during the last 10 years. The danger is that the term itself is getting closer to the thin line between being seen as a panacea by its evangelists and being considered as a buzz-word and a jack of all trades method by its critics (cf. Badke-Schaub et al., 2010).

Design Thinking dates back to the previous century. Based on the foundational work of Simon (1969) on the overall nature of design, this research area has gained an increasing interest. Ever since, the research on Design Thinking has been both theoretically and case-based as well as elaborative. Even longer than this is the discourse on what design means. Krippendorff (2005) summarises the subjective perception of what design is by stating that

> "most outsiders see design as an applied art, as having to do with aesthetics, unlike a solid profession unto itself, with technical knowledge, skills, and responsibilities to rely on. Insiders to design, by contrast, talk of innovative ideas, coordinating the concerns of many disciplines, being advocates for users, and trying to balance social, political, cultural, and ecological considerations. The underlying thread in designers' self-perception is a concern for what people do with artifacts. It differs from the concerns of other professionals by addressing issues of human interfaces with technology, technology understood quite broadly as what humans create – artifacts." (Krippendorff, 2005, p. 47)

This subjective notion is substantiated by the following design and designerly thinking description.

Authors like Buchanan (1992) indicated that the ever-increasing complexity of globalised challenges (will) necessitate new problem-solving approaches. They argued that the way how designers have approached their design problems (i.e. the creation of design objects or artefacts) might render useful insights for solving challenges located and considered as outside of the classic design discipline.

In their meta-study, Johansson-Sköldberg et al. (2013) summarised the body of design research available and identified two different research streams: a design discourse of 'designerly knowing' versus a management discourse of 'design thinking'. They highlighted that the different perspectives on what Design Thinking is and shall be are as diverse as the methods within Design Thinking.

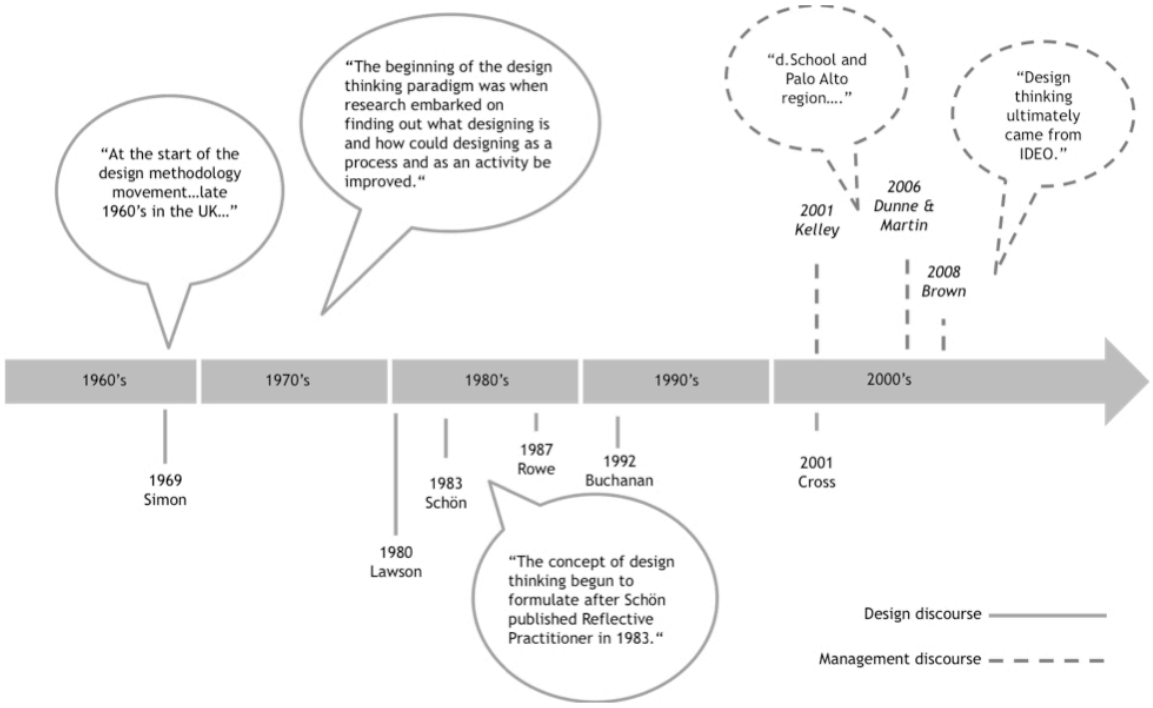

Figure 2.1.1.: Roots of design thinking – Source: Hassi and Laakso (2011, p. 4)

In brief, the two discourses can be summed up as following (see Fig. 2.1.1 and 2.1.2, based on Johansson-Sköldberg et al., 2013, p. 123 ff.): Designerly Thinking and Design Thinking.

2.1.1. Designerly Thinking

The first discourse is called 'designerly thinking'. "This refers to the academic construction of the professional designer's practice (practical skills and competence) and theoretical reflections around how to interpret and characterize this non-verbal competence of the designers" (Johansson-Sköldberg et al., 2013, p. 123). They argued that this research is rooted in the academic field of design and frames the underlying motifs and practices that led to a designerly thinking and to a design expertise. Within this discourse, the authors identified five streams of design and designerly thinking as

- the *creation of artefacts* (Simon, 1969).
  Simon argued that historically the task of science disciplines had been to describe what already exists and "teach about natural things: how they are and how they work" (ib., p. 111). In contrast, design is rather focused on devising "courses of action aimed at changing existing situations into preferred ones" (ib.). The intellectual activities of drawing a painting, finding a new remedy and defining a new social welfare plan did not differ fundamentally for him. Accordingly, the assumed differences in the research world between designers' ways and engineers' ways of thinking became irrelevant for Simon.
- a *reflexive practice* (Schön, 1983).

Schön, originating from a pragmatic tradition, argued in *The Reflective Practicioner* that design is not to be understood rationally (and positivistic) but rather through a pragmatic/hermeneutic point-of-view[1]. He understood the design process as interplay of "creation and reflection-upon-the-creation that allows for constantly improved competence and re-creation" (Johansson-Sköldberg et al., 2013, p. 124). The reflection was understood as an integral part of the design practice. Schön described that this understanding can be transferred to a managerial context: "While managers deal with decisions under uncertainty through intuition, they build up an essentially unanalysable capacity for problem solving through long and varied practice rather than through studying theory or techniques" (ib.). He noted that this process is often unconsciously and managers as well as designers do seldom reflect upon their reflection-in-action.

- a *problem-solving activity* (Buchanan, 1992, based on Rittel and Webber, 1973).
  Rittel and Webber introduced in 1973 their *Dilemmas in a General Theory of Planning* in which they argued that the "search for scientific bases for confronting problems of social policy" (ib., p. 155) is to fail, namely due to the 'wicked' nature of these social problems – in contrast to the 'tame' nature of (natural) sciences. Their reasoning was that social problems can hardly be described exactly and definitely. Even worse, in modern sciences there is often a discourse about the most basic terms and definitions of a problem at hand. Thus "there are no 'solutions' in the sense of definitive and objective answers" (ib.). Rittel and Webber introduced the separation of problem definition and problem solving phase. In the problem definition phase, the problem and its underlying constructs can be clarified leading to a qualification of the problem. Buchanan (1992) built upon this and adapted this line of thinking to the design context. Arguing that designers do not only "decorate messages" (ib., p. 12) but merely should find new "arguments by means of a new synthesis" (ib.) from various sources, he established placements as the "sources of new ideas and possibilities when applied to problems in concrete circumstances" (ib.). "Placements are 'tools' for intuitively or deliberately shaping a design situation, identifying the views of all participants, the issues of concern, and the intervention that becomes a working hypothesis for exploration and development, thereby letting the problem formulation and solution go hand in hand rather than as sequential steps" (Johansson-Sköldberg et al., 2013, p. 125).
- a *way of reasoning/making sense of things* (Lawson, 2006; Cross, 2006, 2011).
  Lawson and Cross were trained architects and used an abductive reasoning process to both derive a design process model from their practical examples. Lawson aimed at describing a model of designing (2006, pp. 289-303) with the six phases of formulating, representing, moving, bringing problems and solutions together, evaluating, reflecting. Cross identified key aspects of design strategies, namely "(1) taking a broad 'systems approach' to the problem,

[1] In that time, sciences were dominated by a positivistic paradigm stating that the exact and rational way how natural sciences are carried out are also to be followed in social sciences and other non-natural science disciplines. Hermeneuticists argued that the interpretation of signs (e.g. spoken or written words) is a valid foundation for knowledge and practices, even when the interpretation cannot be proven 'scientifically', i.e. from a positivistic paradigm.

rather than accepting narrow problem criteria; (2) 'framing' the problem in a distinctive and sometimes rather personal way; and (3) designing from 'first principles"' (Cross, 2011). This is noteworthy because it fleshes out the differentiation between problem definition (framing) and problem solution introduced by Rittel and Webber (1973). Furthermore, his three design strategies and his model (see Fig. 2.1.3) can serve as a theoretical foundation for the Design Thinking education at the School of Design Thinking in Potsdam.

- *creation of meaning (rather than artefacts) (Krippendorff, 2005).*
  For Simon (1969), the design artefact is at the core of the design process, and the meaning of it is an attribute attached to the artefact. For Krippendorff (2005), however, the meaning is "at the core of the design process and the artefact becomes a medium for communicating these meanings" Johansson-Sköldberg et al. (2013, p. 126). While Cross distincts between the *science of design*[2] and the *design science*[3], Krippendorff (2005) turned the semantic notion to a *science for design*. With this he referred to "a systematic collection of accounts of successful design practices, design methods, and their lessons, however abstract, codified, or theorized, whose continuous rearticulation and evaluation within the design community amounts to a self-reflective reproduction of the design profession" (Krippendorff, 2005, p. 209).

2.1.2. Design Thinking

The second discourse is 'design thinking', a term that is related to a management discourse. This means a "discourse where design practice and competence are used beyond the design context (including art and architecture), for and with people without a scholarly background in design, particularly in management" (Johansson-Sköldberg et al., 2013, p. 123). People with no former education in design theory aim to learn and internalise designerly thinking. Usually they are not going to study or do not want or have the time to study the academic field of design first, thus design thinking becomes a discourse about how to transfer the designerly thinking theory to non-designerly backgrounds and fields (e.g. through design management studies). One criticism, especially regarding the management discourse, is that the majority of recent publications rather focuses on hands-on advices and checklists and less on theory building and it is thus less theoretically-robust (cf. ib., p. 127). Johansson-Sköldberg et al. summarise the Design Thinking discourse into three streams: Design Thinking as

- design company *IDEO's way of working* with design and innovation (Kelley and Littman, 2001, 2006; Brown, 2008, 2009).
  Tom Kelley is one of the brothers that founded IDEO, which claims to be the worlds largest design company. In his books, Kelley laid out numerous success stories of the IDEO way of

[2] "Science of design, [...] that body of work which attempts to improve our understanding of design through 'scientific' (i.e., systematic, reliable) methods of investigation." (Cross, 2006, p. 209)

[3] "Design science, [...] an explicitly organised, rational and wholly systematic approach to design; not just the utilisation of scientific knowledge of artefacts, but design in some sense a scientific activity itself" (Cross, 2006, p.208)

designing solutions to given challenges. Albeit critics note that the IDEO approach lacks a theoretical foundation, the proposed framework of interlinked steps to design and find new ways of problem solving quickly became famous. For practitioners of Design Thinking in the notion of IDEO it is usually more important that the process can support teams and individuals in reclaiming their creative confidence than not spreading the word because of a suggested or perceived lack of theoretical foundation. By their hands-on attitude stating that 'everybody could do it', Brown and Kelley invite everyone to try out their process, preferably in a team setting. Although no formal link exists between IDEO and the Design Management Institute, their understanding of Design Thinking tends in the same direction (Bohemia et al., 2012; Lockwood, 2010)

- a way to approach indeterminate organizational problems, and a *necessary skill for practising managers* (Dunne and Martin, 2006; Martin, 2009).
  Martin worked with IDEO and used their Design Thinking approach to revise his former knowledge funnel model (Martin, 2009) and to improve his management education at the University of Toronto (Dunne and Martin, 2006). The knowledge-funnel is a stage-gate model with three stages: The mystery stage (infinite variety of forms for ideas and solutions), heuristic stage (narrowing down the field of inquiry, e.g. by testing) and the algorithm stage (reaching a generalisable formula). Martin understands Design Thinking as "the form of thought that enables movement along the knowledge funnel, and the firms that master it will gain a nearly inexhaustible, long-term business advantage" (Martin, 2009, p. 23). Contrary to Kelley and Brown, Martin solely focused on the knowledge funnel model to operationalise his understanding of Design Thinking to a management and business school environment. He diminished the notions of Schön on the design nature of Design Thinking and rather focused on a linear process instead of the iterative (and reflective) design approach. Accordingly, the education streams of Dunne and Martin (2006) on the one hand and Kelley and Littman (2001, 2006); Brown (2008); Plattner et al. (2010, 2012b,a, 2014) differ substantially. Although Martin's framework is less complex to understand and does not necessitate an demanding engagement with a design-oriented way of thinking, Liedtka and Ogilvie (2012) admit that for reaching the best results, the lead from a designer is inalienable. Thus a certain dive into the way of designerly thinking seems to be necessary for accessing the whole design potential for an organisation.

- *part of management theory* (Boland and Collopy, 2004).
  Boland and Collopy pointed the discussion "less towards design as a way of working or a work process with distinct characteristics (as stressed in the IDEO version) and more towards cognitive characteristics (similar to Martin)" (Johansson-Sköldberg et al., 2013, p. 129). Boland and Collopy collected essays from renowned scientists on the topic of how Design Thinking can be a part of management theory. However, there are different epistemological streams present and a "more robust academic conversation on 'design thinking' within the management realm" (ib.) is yet to come.

Discourse streams	Originator	Discourse Character & Academic Perspective	Relation to Practice / Epistemology Core Concept	Audience
Management discourses	**IDEO & other industry leaders**	Showcase success cases → *experiences, some connections to innovation research*	How we do design thinking *(Kelley & Littman, 2001, 2005)* and how anyone can use it *(Brown, 2008, 2009; Kelley & Kelley, 2013).*	*Company managers (potential customers)*
	Roger Martin (2006, 2009a, 2009b)	Use success cases to illustrate theory development → *cognitive/ management science/ planning theories*	How successful production companies use design thinking and how 'any' organization can do it.	*Company managers & educators (academics, consultants)*
	Boland & Collopy (2004)	Scholars apply their theoretical perspectives to the design area → *different perspectives*	Design thinking as analogy and alternative.	*Academic researchers & educators*
Design discourses of ***designerly thinking***	**Simon** (1996 [1969])	Economic & Political science	Rationalism: *The science of the artificial*	*Academic researchers & educators in the design field*
	Schön (1983)	Philosophy & Music	Pragmatism: *Reflection in action*	
	Buchanan (1992, based on Rittel & Webber, 1973)	Art history	Postmodernism: *Wicked problems*	
	Lawson (2006 [1980]); **Cross** (2006, 2001)	Design & Architecture	Practice perspective: *Designerly ways of knowing*	
	Krippendorf (2006)	Philosophy & Semantics	Hermeneutics: *Creating meaning*	

Figure 2.1.2.: Different major Design Thinking discourse streams – Source: Schmiedgen et al. (2016, p. 134), based on Johansson-Sköldberg et al. (2013)

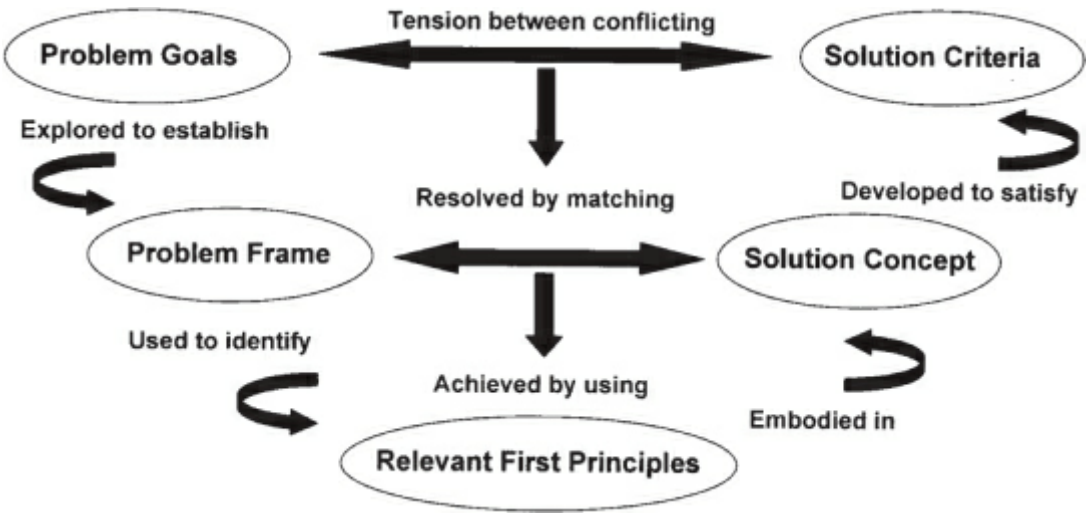

Figure 2.1.3.: A model of the design strategy followed by creative designers – Source: Cross (2011)

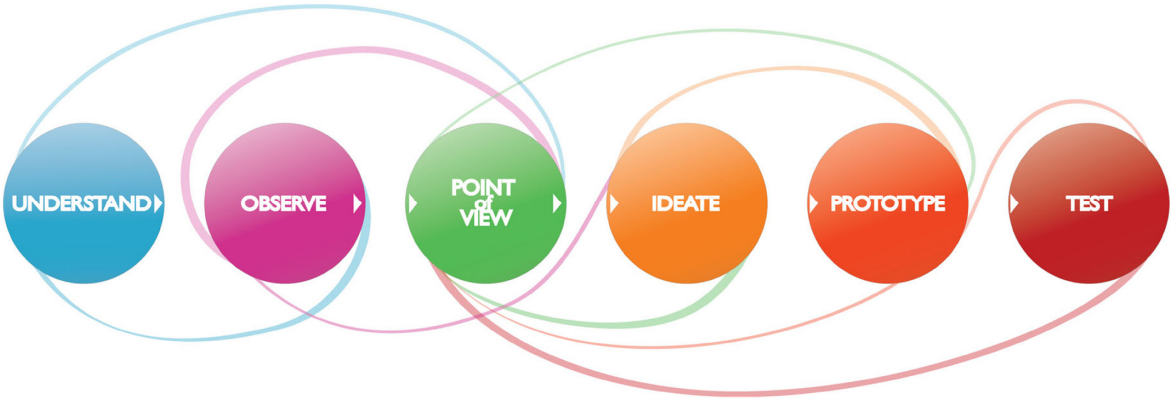

Figure 2.2.1.: Design Thinking process at the School of Design Thinking in Potsdam – Source: School of Design Thinking

Johansson-Sköldberg et al. (2013) closed with "we do not believe that there is a unique meaning of 'design thinking', and accordingly we should not look for one" (p. 132). Following this notion, the Design Thinking understanding for the scope of this thesis is outlined in the next section.

2.2. Design Thinking student education in Potsdam

2.2.1. Implicit knowledge and lead interviews

Johansson-Sköldberg et al. (2013) already mentioned that especially the management-oriented Design Thinking discourse is rooted in hands-on practices rather than an extensive theoretical body. Thus the Design Thinking education evolved through a continuous testing out and improving cycle, similar to the reflection-in-action practice introduced by Schön (1983). Furthermore, the School of Design Thinking in Potsdam as well as the d.school in Stanford carry a tremendous stock of knowledge that is only implicitly available to the stakeholders currently involved at both places.

To make certain aspects that are relevant to the understanding of Design Thinking as practiced in Potsdam available to the reader in this introduction, the author carried out lead interviews. Elements of these interviews are integrated in this introduction to ease the understanding of the Design Thinking student education programme and its underlying reasoning.

2.2.2. Design Thinking paradigm

This thesis does not aim at re-opening the Pandora's Box of reaching a joint understanding of Design Thinking. Instead, it lays out the background to understand the underlying motivation of the Design Thinking student education programme in Potsdam. In its nature, the Potsdam programme is aligned rather to the management-oriented discourse following the IDEO notion in section 2.1.2. This stems from the school's history: David Kelley, the founder of the internationally

renowned IDEO design consultancy, had been teaching design classes in Stanford since the late seventies of the previous century. In 2004, he was a professor for mechanical engineering at Stanford and met up with George Kembel to found the d.school. Closely after this foundation, Hasso Plattner got to know about this new 'design school' and generously supported the building of the Hasso Plattner Institute of Design (d.school) at the University of Stanford. As both Kembel and Kelley had a broad industry experience, they thought of this school as an intersection between the educational / academic world and the professional world. From the very beginning the whole paradigm at the d.school was very pragmatic and hands-on (the famous 'show don't tell' quote stems from this). The School of Design Thinking in Potsdam at the Hasso Plattner Institute in Potsdam became the sister institute in 2007 and has been following the same paradigm.

Tim Brown, CEO of IDEO, explains what the IDEO understanding of Design Thinking is - and this is relevant for the d.schools as well since they have been built upon the experiences previously gained at IDEO. This paradigm is outlined Brown's renowned HBR article (Brown, 2008): Design Thinking as a "a methodology that imbues the full spectrum of innovation activities with a human-centered design ethos" (ib. p. 86). Design Thinking thus focuses on the early phases in the innovation process - identifying user needs, defining promising inventions and preparing the innovation process leading to a new product or service offering. Continuous feedback loops lead to an iterative approach in which the practitioners of Design Thinking need to be ready to completely kill their initial ideas and head for a new direction (Brown, 2009; Kelley and Littman, 2001, 2006; Kelley and Kelley, 2012).

2.2.3. Design Thinking education programme

The School of Design Thinking in Potsdam was established in 2007 and is located under the roof of the Hasso Plattner Institute in Potsdam, which in turn is academically subordinated to the University of Potsdam.

The Design Thinking education overall aims at enabling scholars to be prepared to participate in Design Thinking projects in the future. Furthermore, scholars shall be able to stimulate a design-fostering environment in which new ways of problem-solving and solutions can flourish. In this way, scholars are educated to become Design Thinkers that are able to "match people's needs with what is technologically feasible and what a viable business strategy can convert into customer value and market opportunity" (Brown, 2008). A foundation for this is an ability that the Kelley brothers call creative-confidence - "the natural ability to come up with new ideas and the courage to try them out" (Kelley and Kelley, 2013, p. 115). When participants manage to learn this through Design Thinking education and are less influenced by their fear of failure, scholars can start to "see every experience as an opportunity they can learn from" (ib., p. 38).

So what is the Design Thinking education about? To understand the way how the School of Design Thinking in Potsdam operates, several aspects are important to know:

1. The *process* - this is the guideline of the education programme and each project undergoes the whole process at least once.

Mode	Phase	Description
Emphatize	Understand Observe	"Within this mode, students learn how to *build empathy* in order to better understand and serve people they develop solutions for. In order to reach this aim, tools like interviewing and observation are taught.
Define	Point of View (Define)	"The goal of this mode is to come up with a *narrow problem statement*, which seems to be crucial for the ideation phase. The tools mentioned in this regard are persona, vain diagram and two-by-two matrix."
Ideation	Ideate	The ideation mode focuses on *idea generation*. "Tools like brainstorming or body-storming are typically performed and taught as one way to come up with new ideas."
Prototyping	Prototype	In this mode "students learn how to generate quick and low resolution artifacts. To do so, students are taught a variety of methods ranging from simple sketching techniques to computer simulations as well as physical *prototypes*."
Test	Test	"Within this phase user tests are performed in order to *evaluate prototypes* and to inspire further development."

Table 2.1.: Design Thinking phase descriptions – Source: Based on Rauth et al. (2010, p. 5)

2. The *programme structure* - the programme in Potsdam is structured into a Basic and Advanced track
3. The *personnel structure* - the different stakeholders involved in the Design Thinking education
4. The *participants* - students from all over the world apply for the programme and make the School of Design Thinking a highly interdisciplinary and international place.
5. The *space* - the School of Design Thinking does not look like a traditional university setting. The space is optimised for team work and collaboration.
6. The *team work* and *collaboration* - Design Thinking in the philosophy of the d.school in Potsdam assumes that multiple students from different academic, professional and international backgrounds spark new insights and ideas. Thus the programme is pure team work in groups of 5-6 students, accompanied by a coach.

2.2.3.1. Process

The d.school in Potsdam follows the process depicted in Figure 2.2.1. In 2010, Rauth et al. captured the formerly implicit understanding of the Design Thinking process phases and provided a definition for each phase (see Table 2.1).

	School of Design Thinking, Potsdam	d.school, Stanford
Course format	Basic / Advanced track Pre-defined sequence Self-contained programme	Various modules Students define module sequence Different aspects covered in different modules
Length	1 term per track, 2 terms in total	1-n terms
Application	Open for enrolled students from every university	Open only for enrolled students at University of Stanford
Education format	Team work, supported by team coaches experienced in Design Thinking	Dependent on module

Table 2.2.: Key student education programme differences – Source: Own depiction

2.2.3.2. Programme structure

The programme structure in Potsdam differs from the one in Stanford. Table 2.2 highlights the key differences. Contrary to Stanford, the education programme in Potsdam is not modularised in terms of process phases but consists of two tracks, each lasting one term. The Potsdam programme leads through all Design Thinking phases (Fig. 2.2.1) and provides all participating students with a holistic view of Design Thinking. Today, the Potsdam programme is structured in the following way:

1. The Design Thinking week (a one-week programme) as a primer for interested students. The participation is not mandatory to apply for the Basic track.
2. The Basic track
    a) Motivation: First understanding of Design Thinking, guided on-boarding into the team process and team experience (EW, 47 f.)
    b) Duration: One term, ca. 12 weeks, parallel to University of Potsdam lecture schedule
    c) Frequency: Two days full-time presence team work in Potsdam per week
    d) Application: Written application with T-Profile, followed by a two-day Design Thinking bootcamp as assessment centre ahead of the term
    e) Size: 80 students per term, 16 teams
    f) Sequence:
        i. One-week project: Introduction to Design Thinking, internal challenge
        ii. Three-week project: Deepening the understanding, more complex challenge, still internal
        iii. Six-week project: Guided application of Design Thinking process, challenge with an external project partner (company, organisation, NGO)

3. The Advanced track

   a) Motivation: Experiencing your role in a team working together on a challenge no team member is experienced in (WZ, 31 f.)

   b) Duration: One term, ca. 12 weeks, parallel to University of Potsdam lecture schedule

   c) Frequency: Two days full-time presence team work in Potsdam per week

   d) Application: Written application with T-Profile, only Basic Track alumni accepted

   e) Size: 40 students per term, 8 teams

   f) Sequence

      i. Twelve-week project: Teams apply their Design Thinking knowledge and expertise independently, project challenge together with an external project partner (company, organisation, NGO)

2.2.3.3. Personnel structure

Throughout this thesis, role descriptions are used that are introduced in this section:

- Staff members: Everyone who is associated with providing the Design Thinking education, especially
  - Academic director: This is the academic lead of the whole Design Thinking programme in Potsdam
  - Track manager: They supervise either the Basic or the Advanced track. Their role is to manage their respective tracks, coordinate the coaches for the teams in their tracks, set up the schedule and provide necessary resources. Each track consists of 8 teams, hence two Basic track "subtracks" exist with one track manager each.
  - Coaches: Mostly alumni from the Design Thinking programme, coaches bring in an external perspective and support student teams in becoming proficient in Design Thinking
- Students: Everyone who is or was taking part of the Design Thinking student programme as a student to learn Design Thinking
  - Current Basic / Advanced track students
  - Alumni
- Applicants: Interested students, not enrolled at the moment, but considering to apply

2.2.3.4. Participants

Each term around 200 to 350 students apply in Potsdam to become one of the 80 accepted Basic track students (EW, 56). Contrary to the Stanford d.school, in Potsdam every student from every nationality can apply. There is no necessity to enrol for a university course or programme at the University of Potsdam. During the selection process, attention is paid that the selected Basic track students result in a heterogeneous group from diverse backgrounds and different experience levels (EW, 60). Students that are typically accepted "have been trying to gain or have already gained [...] experiences outside their curriculum in terms of their study curriculum" (ib.). They are interested in working together, are eager to apply (not only learn about) Design Thinking, are rather 'we' than 'I' focused, have often "untypical biographies" - so that "they've been maybe also changing their course of studies and can explain why" (ib.) and that sometimes have already demonstrated entrepreneurial activities.

From the 80 Basic track students, 40 are able to continue with the Advanced track.

2.2.3.5. Space

The space at the School of Design Thinking is noticeably different from a classic university setting. First of all, neither a formal lecture hall exists nor a room with a pre-defined table-and-chair-order like in university seminar rooms. Space is dominated by chairs, tables and whiteboards that can be easily moved and rearranged. Hereby students are encouraged to fit the space to their needs - and these may not change between the track days but also and even within one day. As an example, when in ideation setting one might need more space and room to come up with new thoughts. However, during the define phase doing idea synthesis multiple whiteboards might be helpful to structure the thoughts using post it notes.

Noteworthy d.school facilities are:

- A make space with tools to create small prototype, design applications and print 3D objects
- A workshop room for larger prototype manufacturing
- A library with design, creativity and innovation literature
- A costume and green room to dress oneself up or capture video sequences
- A large garden area for recreation or team meetings in nature

2.2.3.6. Team work and collaboration

Besides the space, this is probably the most prominent difference that visitors experience when entering the d.school: It is all about and optimised for collaboration. Distracting factors (like sufficient resources, drinking water, etc.) are resolved by providing them and being easily accessible. Students can meet up in their team space (this is a section of the large collaboration room that they share with the other teams of their track) or in any other room. The whole Design

Thinking process is designed to be experienced as a team and working-on-your-own settings are very seldom. Coaches accompany teams and provide them with stimuli in case they might have got stuck.

2.3. Success dimensions literature research

2.3.1. Effective and innovation teams in professional contexts

As a foundation for the qualitative interview guidelines, a thorough literature research was conducted. In section 1.2.2, it was already noted that the professional and academic success dimension context does not directly apply to the format of the Design Thinking education programme in Potsdam. For the research objective, it is not of primary interest to understand detailed success dimensions in specific industries, how they might differ from industry to industry and which exact perfomance measures were (successfully) ascertained. Research papers were selected upon providing insights into the overall dimensions that are important to shed light on – and not the specific and detailed findings. Meta-studies provided a helpful and focused starting point for this and the most cited and relevant studies were selected.

Table 2.7 summarises this structure: For example, Hülsheger et al. (2009) stated the importance of team work, sufficient resources and support for team innovation performance dimensions. This led, among similar findings of other researchers, to the introduction of the team work / challenges and team facilitation aspects in the interview guidelines.

Especially in the field of professional work teams meta-studies existed that highlighted key effectiveness and innovation success dimensions. Meta-studies of Cohen and Bailey (1997); Mathieu et al. (2008) spanned the team research literature from 1990-1996 and 1997-2007. Both are looking at overall team effectiveness dimensions in professional settings and their relevant findings are summarised in Table 2.3. Hackman (1987) provided further guidelines on what team effectiveness dimensions shall capture in general. Table 2.4 highlights these results.

In the field of team innovation in a professional context, West and Anderson (1996); West and Altink (1996); Hülsheger et al. (2009) focused on dimensions that foster and enable innovative capabilities and outcomes in professional teams. Table 2.5 summarises their results.

2.3.2. Problem-based learning and Design Thinking

Regarding the Design Thinking education, articles from Peterson (2004) and Rauth et al. (2010) provided relevant insights. Peterson (2004) looked at the problem-based learning (PBL) education, which is the learning that "results from the process of working toward the understanding or resolution of a problem" (Barrows et al., 1980, p. 1). The paradigm of PBL is integrated into the Potsdam Design Thinking philosophy and thus the success dimensions are likely to be relevant for the Potsdam Design Thinking education as well. In addition, Rauth et al. (2010) provided the

Area	Reference	Proposed effectiveness dimensions
Team effectiveness dimensions	Cohen and Bailey (1997)	*Environmental factors* (Characteristics of organisational environment, industry characteristics) *Design Factors* (Task design {autonomy, interdependence, task allocation, product traits}, Group composition {size, tenure, demographics, diversity} Organisational context {rewards, supervision, training, resources}) *Group processes* (Internal processes {conflict communication, discussion culture, collaboration}, External processes {conflict communication, cooperation with other teams}) *Group psychological traits* (Norms, cohesiveness, team mental model, group affect & shared understanding, beliefs, emotional tone, problem-solving style)
	Mathieu et al. (2008)	*Organisational-level performance* (team communication and cohesion, profitability) *Team performance behaviours* (team process improvement {feedback seeking, error discussion, experimentation}, team learning behaviours, team cognitive task performance, team level of proactivity, problem management) *Team performance outcomes* (supervisor ratings {performance, accuracy and quality of work, customer service}, archival indices, dollar sales, instructor-rated performance scores, satisfaction with team service, team innovativeness, external customer satisfaction) *Role-based performance* (team competent to solve challenge w.r.t. task, team and organisational role) *Performance composites* (efficiency, quality, overall achievement, productivity, mission fulfilment, knowledge, quality, quantity, initiative, interpersonal skills, planning and overall commitment, outcome productivity measures {ProMES}) *Affective reactions and viability outcomes* (team / job / organisational / group member satisfaction, team and individual commitment, team atmosphere, collective sense of belonging / social cohesion, team membership stability, extent wishing to remain a team member, treated with respect)

Table 2.3.: Team effectiveness dimensions – Source: Own depiction, based on Cohen and Bailey (1997); Mathieu et al. (2008)

Area	Reference	Proposed effectiveness dimensions
Team effectiveness dimensions	Hackman (1987)	The *productive outcome* should meet or exceed the performance standards (expectations) of the people who receive and/or review the output The *social processes* used in carrying out the work should maintain or enhance the capability of members to work together on subsequent team tasks (group integrity, group burn-out, group able to continue working together) The *group experience* should, on balance, satisfy rather than frustrate the personal needs of group members (are individuals kept away from doing what they want and need to do, are members' predominant reactions to the group experience negative / disgust / disillusionment) Overall effectiveness of work groups as joint function of *process criteria of effectiveness* (Level of effort group members collectively expend carrying out task work, amount of knowledge and skill members bring to bear on the group task, appropriateness to the task of the performance strategies used by the group in ist work (i.e. which choices does the group take to solve the task))

Table 2.4.: Team effectiveness dimensions - cont'd – Source: Own depiction, based on Hackman (1987)

initial academic insight into the Potsdam programme and made implicit knowledge from the first years of the education explicitly available.

Area	Reference	Success factors for professional innovation teams
Professional team innovation	West and Anderson (1996)	*Group processes* (participation, task-orientation, commitment to objectives, and support for innovation) *Personality* (propensity to innovate) *Group structural factors* (size, resources available, team tenure, proportion of innovators)
	West and Altink (1996)	*Individual* (free from threat, psychological safety perception, intrinsic work motivation, sufficient autonomy to try new things, mental health) *Group* (members' training and development background, joint and clear objective setting, high participation levels {interaction, open information sharing, shared influence over decisions, possibility to combine different elements of intelligence}, task orientation {constructive controversy and conflicts to reach task performance} practical support {team climate [clear objectives, participation, task orientation, support for innovation], right size, appropriate resources})
	Hülsheger et al. (2009)	*Organisational* (Flat structures, communication between departments and teams, autonomy for individuals and departments, reduced centralised control, employee freedom to achieve work targets in their as most appropriate perceived way) *Socio-cultural dimension* (cultural differences, political trends) *Team process variables* (support for innovation, vision, task orientation, external communication) *Team* (composition, structure) Rating-influence (self-ratings vs. independent ratings, rating on individual vs. team level)

Table 2.5.: Success factors for professional innovation teams – Source: Own depiction, based on West and Anderson (1996); West and Altink (1996); Hülsheger et al. (2009)

Area	Reference	Researched success dimensions
Problem-based learning (PBL)	Peterson (2004)	*Orienting students* (providing a general introduction to the teaching philosophy and method) *Picking problem* (providing a well-stated and suited problem, ensuring that students derive their own definition of the problem) *Forming team* (problem as a team performance challenge, rather external team set up than self-forming, combining team strengths in 4 learning quadrants: action taking, problem finding, decision making and idea finding) *Supervisor roles* according to PBL team process phase (lawgiver, mentor, coach, facilitator, cheerleader, manager, leader)
Creative confidence model	Rauth et al. (2010)	7 basic *design principles* (human-centered, mindful of process, empathy, culture of prototyping, show don't tell, bias towards action, radical collaboration) 4 stages from "experiential learning theory (ELT)" (concrete experience, reflective observation, abstract conceptualisation and active experimentation) *Design Thinking modes* (Emphasize, Define, Ideate, Prototype, Test) *Creative confidence* as the development of trust in one's own creative skills (risk-taking, experimenting, failing) *Iterative cycles* of construction and reflection (Schön, 1983) lead to confidence and competence in creative behaviours

Table 2.6.: Problem-based learning and creative confidence success dimensions – Source: Own depiction, based on Peterson (2004); Rauth et al. (2010)

2.3.3. Success dimensions derived from literature review

As a result of the literature research, certain dimensions arose. Due to their innovative context, these dimensions are assumed to be also relevant for the Design Thinking student education. As the motivation e.g. in a professional context is different than in an educational one, the success factors itself where not transferred but only the meta-level dimensions. These meta-dimensions served as the skeleton for the interview questionnaire. For an overview of discussed aspects and how these are aligned with the research interview questionnnaire sections, refer to Table 2.7:

- Motivation and understanding (Code: MU)
  - West and Altink (1996) indicated that the individual perception and motivation is a relevant factor for innovation teams. Extended with the notion of Rauth et al. (2010), the motivation as well as the individual's understanding of Design Thinking and his or her general wishes for and expectations of the programme are enquired.
- Learning goals (Code: LG)
  - Following the nature of the education programme, key learnings of the programme are asked. These are extended by the classification of Kraiger et al. (1993) into skill-based, cognitive and affective learning goal dimensions and follow the same notion as a current Hasso Plattner Design Thinking Research (HPDTR) project currently uses to bring Design Thinking education to an open online course environment.
- Learning experience (Code: LE)
  - In order to learn something and reach the learning goals, students undergo a learning journey in Potsdam and this aspect concentrates on their experiences on this journey (in case of interested students not currently taking part, experiences throughout their university learning journey are questioned). One important topic noted by the majority of researchers is the team work and team setting. This aspect is on the hand considered by the team work experience itself as well as by asking for individuals' most challenging moments (following the critical incident technique). As Hackman (1987) stressed, the team work should "enhance the capability of members to work together on subsequent tasks". Carried over to the Design Thinking context, this means that team members learn to work together productively in an interdisciplinary team setting. This is an element in the personal development section of the interview.
- Success perception and personal development (Code: SP)
  - As expected, the professional research of Cohen and Bailey (1997); Mathieu et al. (2008); West and Anderson (1996); West and Altink (1996) all rather focus on the external success perception of team and group work, i.e. the rating or perception of an outstanding party. This is usually the sponsor of the project or the project affiliate. Although this dimension also exists for the six-week and twelve-week projects with

external project partners, in the education context it is equally important to look at the success perception of the individual group members. It is them who shall learn and develop their individual and team capabilities and thus were asked whether and why they consider their participation as successful (or in case of staff members whether and why they consider their job role as successful).

Code	*Motivation and understanding*		*Learning goals*			*Learning experience*			*Success perception and personal development*		
	Motivation	Understanding of Design Thinking	Key learnings	Learning goal dimensions	Individual challenges	Team work / challenges	Team facilitation	Individual	Personal development	External
	MU1	MU2	LG1	LG2	LE1	LE2	LE3	SP1	SP2	SP3
Cohen and Bailey (1997)					X	X	X	X		X
Mathieu et al. (2008)					X	X	X	X		X
Hackman (1987)						X		X	X	X
West and Anderson (1996)					X	X			X	
West and Altink (1996)	X		X			X	X			
Hülsheger et al. (2009)						X	X	X		X
Peterson (2004)			X		X	X	X			
Rauth et al. (2010)	X	X	X			X	X	X	X	
Kraiger et al. (1993)				X						
Hassi and Laakso (2011)			X	X					X	

Table 2.7.: Literature research assignment to interview aspects – Source: Own depiction

3. Research design

3.1. Research question

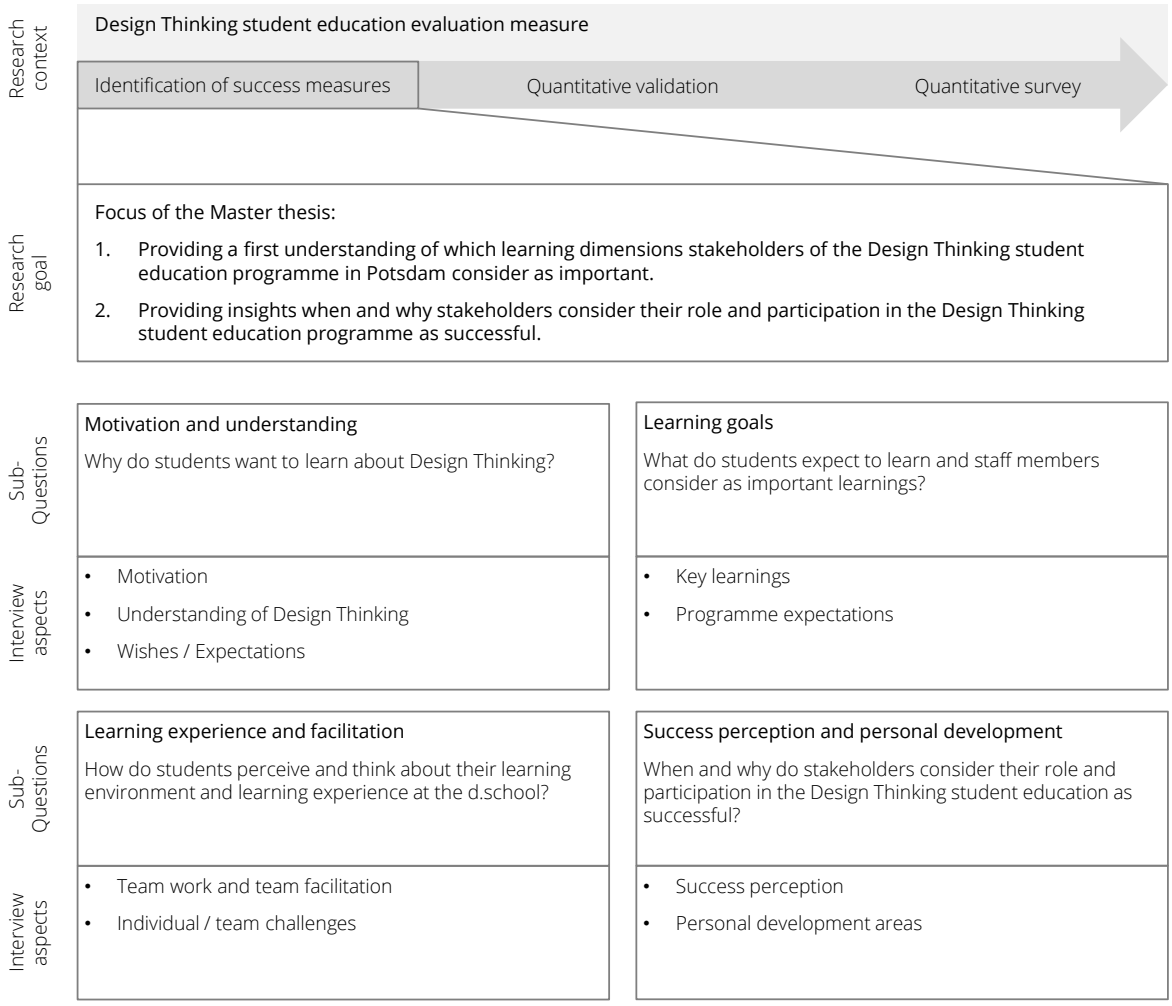

Figure 3.1.1.: Research design – Source: Own depiction

The overall research context of this thesis is to define measures to evaluate the Design Thinking student education programme. To derive this measure, the first step is to identify success measures, followed by a quantitative validation and a large-scale quantitative survey (see Figure 3.1.1). Within this context, as the first step, this thesis focuses on laying the foundation by identifying success measures of the Design Thinking student education programme.

The aim of this explorative study is two-fold:

1. Providing a first understanding of which learning dimensions stakeholders of the Design Thinking student education programme in Potsdam consider as important.
2. Providing insights when and why stakeholders consider their role and participation in the Design Thinking student education programme as successful.

Stakeholders consist of multiple parties and can be classified into the provider of the programme and the recipients: In the first category, track and programme managers as well as coaches represent the providers of the Design Thinking student education programme. In the second category, current and former participants of the programme as well as students interested to apply form the group of recipients (refer also to sec. 2.2.3.4 on page 16).

These aspects lead to the following sub-questions as guiding principles for the qualitative research design:

- Why do students want to learn about Design Thinking?
  - This question focuses on the motivational aspect why people care at all about the Design Thinking programme and consider applying for it.
- What do students expect to learn and staff members consider as important learnings?
  - This question is directed at understanding what the expectations and wishes towards the programme are. This leads to a set of key learning goals that students, interested applicants and staff members consider as important for the Design Thinking education programme and its success.
- How do students perceive and think about their learning environment and learning experience at the School of Design Thinking?
  - This question tackles the perception of the current programme format. It aims at understanding how the learning environment influences the team work, how individuals' experiences influence their success perception of the programme and what students overall feel about the programme.

A guiding principle for the outlook is to connect these findings to the literature review and show commonalities and differences:

- How do the findings connect to the literature and what are potential improvement areas for the Design Thinking student education programme?

3.2. Research paradigm and format

As the research questions are now clearly depicted, the question arises which format is suitable to this research design. According to the classification overview of Hine and Carson (2007) depicted in Table 3.1, the research will follow a realism paradigm (in the notion that reality is imperfectly

	Research paradigms			
Philosophical assumptions	Positivism	Critical theory	Constructivism	Realism
Ontology	Reality exists driven by natural mechanisms. Discrete variables can be measured	Reality is shaped by social, ethnic, economic, political and other forces over time	Reality is constructed by people based on beliefs, feelings and experiences	Reality is imperfectly understood because of human mental limitations
Epistemology	Researcher is remote from reality	Researcher is involved with those being researched	Researcher is a passionate participant	Mutual interaction between researcher and interviewee
Methodology	Experiments and surveys. Mainly quantitative methods	Action research. Researcher is transformative, changing the participant's social world	In-depth interviews. Individual beliefs, feelings and views sought	Case studies. Convergent interviewing. Interpretation by qualitative and/or quantitative methods

Table 3.1.: Philosophies underpinning research paradigms – Source: Hine and Carson (2007, p. 4)

understood, e.g. due to individual perceptions, contexts, and human limitations). The explorative and in-depth interviews partly overlap with constructivism but the author did not engage with the interviewees in their daily experiences. However, the author has a profound pre-knowledge and is very experienced in Design Thinking and could hence interpret certain answers of interviewees against the background of his previous experiences.

Dresch et al. (2015) and van Aken et al. (2012) argue to differentiate "three processes for knowledge generation: theory development, theory testing, and reflective design" (Dresch et al., 2015, p. 81). The first one is about relationship-building between different dependent and independent variables. The second, theory testing, is about propositions of relationships that are tested. The third one, also known as academic problem solving, is based on the problem-solving cycle (see Figure 3.2.1). This process is suitable to address the research question at hand (although not a business context, the process can be adapted to an education context as business in the notion of van Aken et al. (2012) is rather a description for an external entity or organisation).

The interviews are highly explorative (cf. Chapter A on page 103) and a mutual interaction with students, applicants, coaches and staff members takes place during the in-depth interviews. The open and critical incident questions try to understand (interpret) "the meanings, purposes, and intentions (interpretations) people give to their own actions and interactions with others" (Given, 2008, p. 459). The research is transdisciplinary to the extent that the design transcends "disciplinary boundaries to create novel ways of thinking about the topic of interest" (ib., p. 448). Novel ways of thinking become necessary as there is no prior research available for the research question at hand. Thus two scientific disciplines (Design Thinking and innovation management

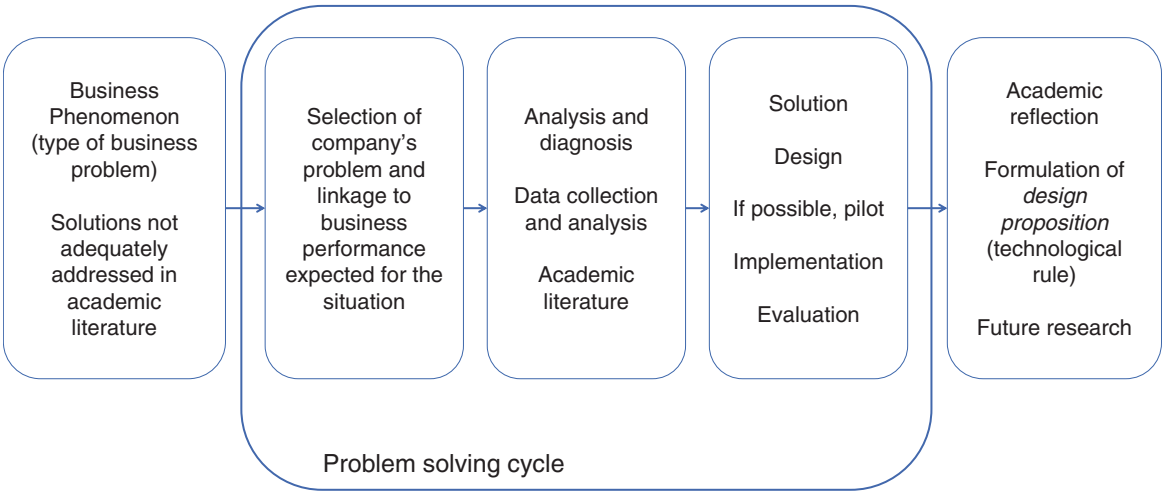

Figure 3.2.1.: Problem solving cycle – Source: Dresch et al. (2015, p. 81), based on van Aken et al. (2012)

success research) are intersecting and, if applicable, extended by insights from other areas.

Regarding the data collection, a method is needed fulfilling the following demands:

- As the study is explorative and there are only analogous assumptions of relevant success measures, interviews need to be carried out in a non-biasing format (i.e. in the invitation and at the beginning of the interviews, no direction of thought shall be induced)
- The interview process needs to be self-improving, meaning that throughout a series of interviews patterns can emerge and can be adapted if necessary
- The interview method needs to be suitable for interviewees to tell their personal experiences and perceptions of interactions and relationships

Assessing these demands, case-based in-depth interviews are chosen. A qualitative and interpretive paradigm is applied to qualitatively understand success dimensions in Design Thinking student education.

Between November 2015 and February 2016, 13 persons were interviewed in total:

- 4 program / track manager, 2 coaches on the institutional side
- 5 current and 2 prospective students on the participant side

The interviews were conducted in a semi-structured way (cf. chapter A on page 103). Questions were mostly open and some based on the critical incident technique to derive insights into the stakeholders' experience of Design Thinking education. The direction of question was based on the literature review on success research in innovation management (see also the previous section). All interviews were transcoded word-by-word and these transcripts serve as the base for the following result part. Based on the pre-structure derived from the literature review (section 2.3.3 on page 23), the overall main coding categories were already pre-defined. Within these major categories, open coding was performed to analyse and synthesise the interview results.

Part II.

Research results

4. Motivation and understanding

4.1. Word-of-mouth recommendation is a strong motivation apply for the d.school

In short
The Design Thinking education programme has a wide reach and most interviewees had a personal touchpoint (e.g. friend or fellow) that promoted the programme. Besides getting to know diverse (background) but like-minded (design ambition and mindset) people, certain aspects of the Design Thinking skill- and mindset (e.g. openness, trial-and-error, being oneself) resonated with interviewees and led to an application for the d.school programme.

Interviewees mentioned various reasons why they applied for the d.school and they provided a deeper understanding of the individual people. The key motivations are summarised in Table 4.1. Broadly speaking, the group of students and applicants can be divided into two groups - one with no previous Design Thinking experience and the other with a former introduction to Design Thinking. This introduction was by participating in short Design Thinking workshops (a couple of days to some weeks) that were either organised at the university (AQ, 4; KF, 25), at a company (HN, 9) or via a workshop that one student held several times together with a partner that was experienced in Design Thinking and integrated methods and process steps (KP, 4).

Regarding the first touch point, besides the workshops it is noticeable that all students, prospective applicants and nearly all staff members / coaches had a first touchpoint with Design Thinking by word-of-mouth recommendation. These recommendations were by friends and fellow students or employees that themselves had either heard or experienced Design Thinking beforehand. This indicates that Design Thinking itself is a rememberable process and people are supportive to share their information about it with other people.

The Design Thinking education programme aims at a high diversity of the participants and this was represented by the backgrounds of the participants interviewed. Fields of studies ranged around Design, Business, IT, Art and Cultural Management, Political sciences, Iranian studies, Sociology and Psychology. On the institutional side, these backgrounds were diverse as well, including Business, History, Public Policy and Public Management and Neuroscience studies. Multiple interviewees stated that they had changed their field of study throughout their academic career (e.g. from Architecture to Design Studies or even from a student trainee programme at a large car manufacturer to Medical Biology to Neuroscience) as well as their professions.

The primary reasons were that the interviewees were disappointed by their studies or professions, mainly because of a misfit with their perception of themselves. This motif, along with a certain trial-and-error philosophy (try a new study field, see whether it fits better or not) is remarkable and also a possible explanation why the Design Thinking has resonated with them ever since they had first got to know about it.

The motivations to apply for the Design Thinking programme are manifold: One student liked the chance of coming to Berlin (KP, 4), getting to know like-minded people and exchange your perspective among team members from disciplines you would otherwise not have any contact with (KP, 4; VK, 17) and to support your ambition of launching a startup that you were afraid of before (HN, 11) or to use the tools and methods for the creation of a user-centered cultural education programme (KY, 10). Another student liked the collaboration and discovery aspect (VK, 17), the out-of the box thinking (HN, 11), behaving to one's inner nature (HN, 11; KZ, 4) and the creative and open process (KZ, 43). Thus Design Thinking is considered to be "a new process that is valuable to one's life" (KY, 26), something usually not possible in one's academic studies (KZ, 43).

One student with a background in Philosophy, Art History and Sociology, portrayed both the common bias of Design Thinking ("weird" people wasting post-its) and the moment when she realised that she wanted to get to know more about Design Thinking:

> So this was my moment where I thought, ok, this is Design Thinking, not only the funny furniture and the post-its, but like really having this team group-work where you - in a first moment think it doesn't really fit together, the guys are so weird - and then in the end you think like, ok, every single moment was like enthusiasm, power, synergies and coming up with things that you would not have found alone. (AQ, 7)

4.2. Design Thinking understood as innovative problem solving in diverse teams

In short
Although no common definition of Design Thinking has been depicted by interviewees, their definitions revolve around the following core aspects: *diverse teams*, *collaboration* and solve problems in a new way (i.e. *innovative problem solving* - in a *non-designer background* environment).

As mentioned in section 2.1 on page 5, the term Design Thinking does not have a natural common understanding among different people. This derivation from the literature was also present in the interview sample. However, interviewees mostly felt attracted to and followed the pragmatic perspective of the IDEO Design Thinking understanding. This is most likely due to the mental connection of Design Thinking with the student education programme offered by the d.school in Potsdam and - if applicable - the experiences already gained at the d.school.

Dimension	Area	Examples
Application motivation	Experience and recommendation	Previous Design Thinking experiences (Design Thinking workshops at university or company) Word-of-mouth recommendation by previous participants (friends, fellow students, colleagues)
	Personal development and change ambitions	Disappointed by previous studies or professions (no fulfilment, misfit with one's inner self) Make a new experience (new perspective, valuable to one's life, not possible in one's academic studies) Discover new things (out of the box thinking, creative and open process) Support own professional ambitions (launch a startup, create a cultural programme)
	Team up	Meet like-minded people Exchange with new people in interdisciplinary teams (diverse backgrounds like nationality or study fields) Open projects and contribution format (everyone can contribute)

Table 4.1.: Key motivations for the d.school programme – Source: Own depiction

An applicant described Design Thinking as "the manner of how to [...] plan and implement projects and how to hustle things along [...] in a way that not the IT guy does one project field and the psychologist another field, but in an integrated form that everyone can contribute his opinion and drive the project" (VK, 11). This rather project-oriented point of view is amended by a qualitative dimension that Design Thinking could "help ideas and problems to be [...] understood better, to be solved in a certain way, [...] to explore an idea" (KY, 30).

Students of the current Basic and Advanced track had already integrated a designerly way of thinking. Asked how they would describe Design Thinking to people who had not got in contact with it before, students stated that they would fit their definition to something that these people already knew "because Design Thinking is so much knowledge you can always describe it in different terms. " (AQ, 9; similar HN, 13). Definitions ranged from very short and hands-on descriptions of Design Thinking:

- "a user-centered approach to solve problems in an innovative way" (KF, 27)
- "creative chaos process a little bit more structured with a lot of post-its" (AQ, 6)
- "a team method to come up with [...] innovation in an interdisciplinary team" (AQ, 9))

to more sophisticated versions:

- "to bring together people and to find through constant communication and changing [...] ideas that you wouldn't have found alone" (AQ, 9). The aspect of "[...] interdisciplinary teams is for me really important and then to come up with innovation that you would not ever find alone. So that it brings always different backgrounds into it, and that it fits to

the need of the person, so of the person you have as your persona" (AQ, 11).

- "a working culture or working mode to find innovative solutions for different life fields like [...] social problems, product like economic products, whatever - because like if I describe it as like innovation method, like people just go into the .. I don't know [this] business field mentally." (HN, 13) So the challenge is to describe the complexity of Design Thinking as being more than a process and set of methods but being also the way of how you think about problems. Thus "I think you have to do [it] to understand what it's about. And that's what many other students at the d.school told me - that it's just like - it's in the end like you describe it or you can't try to describe it - but it's like it never transmits the whole story, the whole spirit" (HN, 13).

Staff members and coaches usually demonstrated a highly re-iterated definition due to their longstanding experience:

- A "mindset for complex problem solving, [...] in particular compelling in terms of finding the right questions and that's for me actually something that I quite often use so this is like the mindset. Not just try to get to go for the right answer but try to get your question right. Are we like focusing on the right question." (EW, 26)
- Applied creativity to "harness and use creativity" (PK, 19) and to "make the world more human" (ib.) because there are more and more people "not paying attention to people and their needs, paying attention to the market or paying attention to technology" (ib.).
- "[...] a common language for people from different disciplines to get things done together" (PK, 19) - so Design Thinking has not invented something new but rather providing "a language around it and [...] a community around it so that we now have a critical mass of people who can work together" (ib.).
- "Mobilisation of pluralism: [...] we have small teams of interdisciplinary members and we try and provide them with a method so that they can work together and solve problems." (PF, 18)

An experience dimension might be necessary in order to fully grasp the concept of Design Thinking. This is one line of reasoning for the high controversy about Design Thinking, even when discussed not in the broad academic range but in the hands-on, IDEO-spirit version used by the d.school.

5. Learning goals for the d.school programme

Building on the motivational side, this chapter sheds light on the outcomes Design Thinking student education programme itself: What do students expect to learn, what should they learn and what are their key take-aways. In the first section, wishes and expectations are summarised, followed by individuals' key learning goals. In the last section, replies of staff members and coaches towards different learning goal dimensions (skill-based, cognitive and affective) are analysed.

5.1. Applicants expect to become confident in the Design Thinking process

In short
Applicants expect to discover and understand the Design Thinking methods and want to learn how (diverse) project teams can be managed and organised. Some interviewees do also expect to be able to guide own Design Thinking projects and train others after finishing the d.school programme.

Wishes and expectations of (prospective) students for the d.school programme were manifold. They can be grouped in three major categories: Programme, learning and personal development expectations. The results are depicted in Table 5.1.

Programme-wise, participants and applicants expected to have a great experience (KP, 21) in an interesting and filling community of like-minded but diverse people (KP, 21; AQ, 32; KZ, 59). Applicant KY showed no preference towards participating in challenges with a NGO or a corporation because she wants to learn how to apply the process in different settings (KY,40). On the contrary, track manager PK spoke about students that had expected to solve NGO and policy challenges instead of corporate challenges and felt that the "problems we work on are not really the ones they came here to solve" (PK, 56).

Learning-wise, students expected to learn about the methods and processes of Design Thinking in a team with diverse people, a stimulating environment and support through coaches (KY, 34). KY indicated a strong "eagerness to learn" (ib.) and expected the same eagerness to learn from her fellow students at the d.school. VK had a more project-oriented view and wanted to learn about different working modes in teams, how to do and manage projects and how to professionally search for new ideas (VK, 21). He particularly wanted to gain a holistic project view integrating different point-of-views from project stakeholders (ib.).

Dimension	Area	Items
Programme expectations	Personal level	Have a great experience
	Team level	Interesting / filling community of like-minded but diverse people
	Program-level	No preference for NGO / business challenge
Learning expectations	Design Thinking-oriented	Learn about methods and processes of Design Thinking Strong eagerness to learn and expectancy that other students demonstrate the same eagerness
	Project-oriented	Learn how to manage teams Deal with different working modes Professionally search for ideas Gain holistic project view
Personal development expectations	Creative confidence	More confidence to apply Design Thinking at own projects Full understanding of Design Thinking Ability to reflect one's design capabilities

Table 5.1.: Key expectations of the d.school programme – Source: Own depiction

Personal-development is the third expectation mentioned by interviewees. KY hoped for becoming more confident in applying Design Thinking on her own (KY, 34). She wanted to use Design Thinking to start own projects (KY, 28; HN, 11) and needed to fully understanding Design Thinking to be able to apply her skills and refine them during the application (self-reflection).

5.2. Three areas of key learnings: Team experiences, Design Thinking process learnings and personal development

In short
Key learnings and experiences lie in three areas: team experiences, Design Thinking and personal development. Multiple notions mention the importance of a productive team work and state how relevant it is to openly reflect yourself and to question your basic assumptions (even your world view). In this nature, the Design Thinking programme goes beyond a classic training programme and invites participants to reflect upon and change their mindsets.

Current students and staff members were asked for their perspectives on the key learnings and experiences that they have experienced and that students shall experience throughout their time at the d.school. Three clusters arose from the interview replies: Team experiences, Design Thinking process learnings and personal development. Key findings are summarised in Table 5.2.

All interviewees noted the importance of the team experience as a key learning. Students shall learn how to work with people outside your field of expertise (KP, 25). One learns "how good

team works from completely different backgrounds" (HN, 27), namely by agreeing on a common level (ib.), handling the different team roles you might play in different team constellations (AQ, 32) and dealing with an egalitarian team format (PF, 21) that results from having at least a couple of alpha members in each team (KZ, 60).

Notions regarding the Design Thinking process were differing and pertained different Design Thinking process steps (cf. Fig. 2.2.1 on page 11). KF and KP stressed that user research (observations) is important and the "more research you do the better it is" (KP, 25). With research being key, the best way to gather user feedback is to make your idea tangible, i.e. prototype your idea. It is an important learning for KP that the prototype doesn't need to fulfil high design expectations and for KF that teams often need to end discussions about how to prototype an idea and just start building it (KF, 29). In the synthesis phase were a magnitude of insights and ideas needs to be cut down to one persona or one prototype the group dynamic is hard to handle (KF, 29) because one needs to "kill insights and ideas" (ib.). Reaching a state that every team member can back the decision is the key learning of this.

Track manager PK challenged the notion of "learning the methods". She stated that it is - method-wise - important to "understand what a method is" (PK, 25) instead of only learning it by heart. She indicated that "intellectually it's pretty easy to get the basics of how to do a good interview. Emotionally it's very hard to go to a good interview" (PK, 25). Methods shall support students to overcome their emotional challenges and empower them to go beyond the existing methods and create their own methods (ib.).

The third cluster touches on the personal development that students shall experience. The d.school aims at providing students the necessary environment and support to become innovators and change makers (EW, 33). This necessitates internalising a specific skillset and mindset (ib.). The mindset one shall learn is that there is no perfect solution (WZ, 17) and one's view is only one view of the world, not the view (ib.). Otherwise an open team discourse is not possible in which one can "just say what you think and try out your own ideas" (KF, 37). One learns to accept other people as they are (ib.) and to trust in having a result in the end even if it cannot be imagined at the beginning (HN, 27). Contrasted to a university setting, students learn to trust in other students' ideas (KZ, 60) and to build upon them instead of dominating the decision process (ib.). The second mind shift is to become empathic and learn how to "walk in the shoes of others" (EW, 33). This consciousness is important to start exploring the world of the user one is trying to solve a problem for (SK, 19). The third aspect is that a student shall develop himself as a personality (EW, 33) and start a continuous learning process of experimenting and exploring (SK, 19) the world around him and the world of the user.

These developments in one's team and personal abilities shall lead to an "emotional maturity" (PK, 24). In this state, built on a higher self-awareness and self-knowledge (ib.), one's abilities to trust in uncertainty are developed. Together with regular team- and self-reflections throughout the education programme, students shall gain a higher creative confidence (SK, 17; AK, 13), i.e. the belief in one's own creative capabilities and perceived self-efficacy (cf. Bandura, 1978).

Dimension	Area	Items
Team experiences	Work in interdisciplinary teams	Work productively in interdisciplinary teams Deal with a team with multiple alpha-people Deal with an egalitarian team setting
Design Thinking process	Process understanding	Understanding importance and interplay of different process phases
	User research and observations	Conduct interviews, observe users
	Synthesis	Manage group dynamics while "killing" insights and ideas Reach team consensus
	Prototyping	End team discussions, start building and making idea tangible
Personal development	Mindset to become creative	There is no perfect solution Accept different point of views Accept other team members as they are Build on the ideas of others instead of only deferring / judging them
	Gain empathy	Become conscious of the user and oneself Start exploring the world of the user and the seeing the world around oneself with different eyes
	Emotional maturity	Gain higher self-awareness and self-knowledge
	Creative Confidence	Belief in one's creative capacities and perceived self-efficacy

Table 5.2.: Key learnings of the d.school programme – Source: Own depiction

5.3. Basic and Advanced track address affective, normative and ethical dimensions

In short
The learning classification scheme (cognitive, skill-based and affective) of Kraiger et al. (1993) did not provide for a differentiation between the Basic and Advanced track. Differences lie in the degree of independent team organisation: Coaches take them by the hand in Basic track projects; in Advanced track they need to do the planning and organisation on their own. Noticeably, the garbage can model provides a starting point for future discussions – proposing the d.school as an organised anarchy organisation.

Besides the open interview phase institutional interviewees were asked for the differences of the Basic and Advanced track in terms of learning outcomes. The motivation for the split-up was the introduction of the Bologna process leading to the separation of former Diploma study courses into Bachelor and Master, accompanied with a stronger internationalisation and student mobility. Thus the former one-year (two terms) programme was not suitable for students any longer and the Basic and Advanced track lasting one term each were introduced. The Basic track is described to focus on the "Design Thinking process itself and team experience" (EW, 47). Students get to know the way of working (e.g. how to cope with team dynamics) and the organisational framework (e.g. how to document one's project). They are stimulated to become more aware of themselves and their role in a team (WZ, 31). The advanced track is more about the project and the application of the learnings from the Basic track (WZ, 31). While in the Basic track the focus relies on understanding the customer, in the advanced track the dimension of understanding the project partner's organisation is added (EW, 51). PK summed up the personal development of students:

> In Basic track we want to teach people the methods of Design Thinking and we want to make them into Design Thinkers, in Advanced track we want to make them into themselves. (PK, 45)

Following the proposition of Kraiger et al. (1993), the interviewees were also asked on which dimension (cognitive, skill-based, affective) each track is focused on. The association to a specific track was rather heterogeneous. For example, EW noted that it is even questioned which skill set shall be taught. Should the programme really aim to have good interviewers capable of doing qualitative interviews as an outcome? "I would say 'No'. Because this is something [...] that can be learned [...] in social science. But it would be great to have somebody who is able to seek out for inspirations, to explain to somebody why we do [something] or we are going to make [...] an immersion [i.e. going to a specific place and wholly engaging with the environment and people there]" (EW, 86). Generally speaking, a certain ability (e.g. doing qualitative interviews) is necessary and that it needs to be learned is not neglected. However, this learning is not the core aim of the d.school but it is that students look beyond these abilities and understand why they learn and do what they learn and do. PK described that the tracks cannot be matched with the

three dimensions because all of them are addressed in both tracks. For her, it is rather that the Design Thinking education in the Basic track provides students with different methods that they know at a basic level. In Advanced track, students are asked to decide and take some of these methods and push them further or even discover new ones if needed (PK, 67). The decision where to focus on and to dive deeper resides on the individual since "what advanced Design Thinking is is different for everybody" (ib.).

PF introduced the garbage can model of Cohen et al. (1972) as an alternative approach to the learning goal dimensions. Cohen et al. described organisations like universities and the d.school as "organized anarchies" (ib., p. 1). Four streams flow through these organisations: Problems, solutions, participants and choice opportunities. These streams are randomly flowing through the organisation and to get something done is to integrate all four streams and create a decision opportunity. Translated to the Design Thinking programme, the d.school provides students with the tools to address problems and find solutions as well as provides student teams with the opportunities to make decisions and see how it all works together. For PF, there is also a normative and ethical aspect of Design Thinking in the sense that "some approaches or some things we do are good and others are not good" (PF, 63). Especially in Advanced track teams there can be a lot of tension between coaches and teams. Teams don't tolerate coaching interventions as openly as in the Basic track and even dismiss the coaching intervention. So aspects of what are the needs of team and how much intrusion is supportive or tolerated underlie this normative notion - which can differ between team and staff members. PF explained that the ethical aspect is also not as explicit as it should be, but becomes visible in the Advanced track by experiencing for example what a good coaching intervention is and learn to differentiate the good one from a harmful one.

Altogether, the model of Kraiger et al. (1993) did not provide a helpful starting point for a differentiation between Basic and Advanced track. Even within one track, the classification scheme is somehow applicable but does not really provide for additional insights. In both tracks, all three dimensions are addressed more or less at the same time. One outcome of this questionnaire section is that the garbage can model of Cohen et al. (1972) is an interesting organisational perspective to describe the d.school as an organisation and that there might be - besides cognitive, skill-based and affective - also a normative and ethical dimension. Overall, the Basic track is considered to be more about getting to know the basic knowledge and tools and beginning to internalise it and to think in new ways. If one dimension is mentioned multiple times, it is the affective dimension. This indicates that the main focus of the programme is in general the affective dimension in terms of personal growth, personal leadership and the reflective mode (EW, 88). The reflective mode is the ability to regularly pause for a minute and to reflect upon the individual and team progress as well as the team situation. This reflection is used to adjust different aspects to support the project, team and personal development process.

6. Learning experience and facilitation

6.1. Students wish for an open discourse environment at their universities

In short
In their academic background, current students and applicants face different individual challenges. Notably, students missed an open discourse environment and experienced their study programme as too structured and not opened for own thoughts and discourses. This underlines their motivation for the d.school programme, yet the openness at the d.school comes with a price tag: Students need to become resilient to stand the constant and ongoing reflection and feedback process.

As part of the learning journey at the d.school, students arrive in the programme with a specific influence of their academic background. In this section, challenges on the individual level are analysed. As many individual challenges to some extent also correlate with team challenges, the separation was made by the assumed core direction of the challenge: Is it about my personal experience and my role or is it about how the team is operating and how I'm working in the team. To shed light on their experiences, programme participants and applicants were asked for their biggest individual challenges throughout their academic career (in a following section, the team dimension is outlined). The key results are depicted in Table 6.1.

On the personal side, interviewees mentioned commodity challenges that most students are likely to experience: Balancing the study workload (KP, 10) and getting into the programme by organising oneself and learning basic study techniques (HN, 15; KY, 12). In section 4.1 it was outlined that d.school participants have a tendency for "untypical biographies" (EW, 61). Thus one interviewee stated that he had tried multiple study fields and also switched his final thesis because he did not feel comfortable and confident with the initial topic. This indicates a certain indecisiveness that might be one of the biggest challenges – using ones reflection potential but still not losing track of a realistic life goal.

Organisational-wise, students had to struggle with illogically structured study programmes (VK, 27; KF, 7) that seem to be common to students. A specialty, however, is that applicants and students demand for an open discourse environment at their university. Study programmes are perceived as too theoretical, too structured and too focused on learning by heart (AQ, 15; KZ, 4). AQ wished for an opportunity to work on her inner-learning (self-development) and struggled

Dimension	Area	Examples
Personal (own studies)	Work / study balance	Balance demanding study course with social life
	Study organisation	Organise oneself, learn on your own (deal with other-directed knowledge and evaluations) Indecision with final thesis (Changing topic, not enough confidence perceived)
Organisational (own studies)	Programme structure	Study programme not logically structured (Sequence of lectures not based on each other, complicated internship requirements)
	Open discourse environment	Study programme too theoretical, too structured, focused on learning by heart (not about inner-learning and -motivation, no alternative perceived to continue the programme, no daily application of the academic contents perceived) No possibility to share own thoughts and ideas (Take other peoples' ideas instead exploring and connecting own ideas)
Personal (d.school)	Personal development	Stand and survive the ongoing team feedback Constant reflection and requestion of one's team role and oneself (Find a balance between adapting to the team or process needs and be oneself)

Table 6.1.: Individual challenges in own studies (applicants and current students) and d.school (current students) – Source: Own depiction

with keeping herself motivated while not losing her passion for learning (AQ, 16). KY saw no possibility to share her own thoughts and ideas as the goal was to "take other peoples' ideas and reword them" (KY, 12) instead of "being able to take somebody else's idea, explore that and [...] connect it" (ib., 14).

Within the d.school programme, most challenges arose in team work and are the subject of the next section. Personal aspects that were mentioned regarded the personal development that goes hand in hand with an ongoing feedback process and high team diversity. "So on the one hand you have to adapt and develop yourself all the time - but on the other you still need to be consistent and [...] also a little bit strong enough to stand that constant feedback you get from the group" (AQ, 26). It is about finding the balance to "making you fit and also be who you are" (ib., 32).

6.2. Programme managers and coaches experience high personal and emotional demands

In short
Besides students, also programme managers and coaches experience individual challenges in their daily student-interactions. Their challenges lie in handling emotionally charged situations, finding their right coach role and developing their own personality to deal with the job role as well as emotional and workload demands.

Staff members and coaches interact on a daily basis with students in the Design Thinking programme. In these interactions, EW reported that a particular different situation is when team members are deeply offended by other team members in a way that they even start to cry (EW, 41). Also situations where students demonstrate inappropriate behaviours are sometimes hard to deal with. PK illustrated a case where a student made a "really sexist joke" (PK, 40) and was not perceptive at all. In extreme cases even whole teams do not work at all. PF described one term in which a team "just could not work together although they really liked each other" (PF, 30). It was like "they'd start working normally and we were watching them and then they just fell apart in front of your eyes for no reason. Within minutes they were pissed off and off in different directions and no cues to" (ib., 32).

These instances relate to the personal development challenges of staff members. The onboarding process for new programme managers and coaches is demanding (EW, 39) since many have no experience in teaching according to the d.school philosophy and programme. She tries to lead from behind and to trust in them while they make their first experiences with students (ib.). If some behaviour is wrong at the beginning, it is important to not intervene at that moment and in public "because then we would not give [the new staff member] the space to gain credibility from the beginning" (ib.). AK confirmed that this challenge of onboarding exists and especially one needs to become more flexible, more open to complex situations and personally less stiff as a d.school coach or programme manager (AK, 19). Lastly, the emotional demands of touching stories from students (SK, 26) and the workload on the track days is something staff members need to deal with and grow into (ib.).

Dimension	Area	Examples
Student interactions	Emotionally charged situations	Deep offensives between team members (Student crying at d.school) Inappropriate student behaviours (Student making a sexist joke)
	Coach role	Students not open to listen to one (students not open for coaching and reflection) Teams just not working and one can't do anything about it
Personal development	Job role	Getting started with one's role in the programme Balance easy-going and being strict as appropriate Deal with circumstances even if not feeling completely confident in certain areas Work closely with programme managers (trust in them, lead from behind, train them, not intervene in public)
	Emotional	Deal with emotional and personal stories of students
	Workload	Stand the high demands on each day

Table 6.2.: Individual challenges of staff members and coaches (institutional view) – Source: Own depiction

6.3. Students do not experience their academic team work as team work, some not even as group work

In short
All interviewees share previous project work experience in their academic studies. No interviewee would call the academic experience a team work, some even do not call it group work but just work distributed among students. Challenges were especially the missing team experience, uneven workload distribution and the competition for group signup and the competitive situation within groups.

The critical incident technique was used to ask interviewees for their most challenging team or group work experience. A differentiation was made between experiences during their academic studies and experiences during their d.school time (in the following section). Experiences in academic studies were structured in two dimensions: General and structural. Key results are depicted in Table 6.3.

Generally spoken, all interviewees reported that they had done projects throughout their studies. This group work was repeatedly reported to be too seldom (VK, 29; KY, 16) leading to an "incredibly low level of student interaction" (VK, 29). As students were not directed towards a specific aspect of experience, multiple students elaborated upon the notion of "team" versus "group". KZ argued that in his studies it would not have been even group work as it was "no team process, just workload distribution" (KZ, 23) solely about summing up and presenting available

data and papers (ib., 21). This experience was "harmonious because mostly only work delegation and no discourse" (ib, 23) was carried out. Thus the denoted harmony cannot be considered as a quality indicator (ib.; AQ, 18; KP, 12). AQ added that in her Master studies it was "a group, not a team" (AQ, 18) because it was focused on efficiency and job fulfilment (ib.).

> I had a lot of study groups [...] [in which] we studied together and that was very valuable. But doing like presentations that was not. [...] I really think it's when people have a desire to be there and want to learn about that topic. I think the experiences come from your desire [...] but I didn't experience that. (KY, 18)

Structurally, KY observed that in her group works all members shared the same background (as can be said of most course work within courses for one specific study programme). She experienced this circumstance to be limiting the group's creative and innovative potential (KY, 16). Process-wise, KF and KY complained the uneven workload distribution in academic group work. Usually the ones most experienced take the lead and do most of the work (KF, 13) and the other group members can either follow up and arrange themselves with them or ar left behind. Some people do participate and some do not (KY, 18). A result can be the formation of an inner and outer circle within the group or even multiple conflicting circles of sub-groups. Moreover, the processes how groups are set up and the group work is carried out do often favour competition for group participation in the beginning and between group members later on. If group affiliation is left to a random sign up process and students "compete with each other so much and they signed-up in two seconds in groups" (AQ, 18), many students "just had like any people that were left and mostly they didn't fit to whatever you were thinking" (ib.). The inner-group competition arose from the fact that the group tries to get the best grade as most group works are graded in the end. This notion is in contrast with KY depiction that "experiences come from desire" (KY, 18) and should not come from grades. Lastly, VK noted that for him it was a challenge when multiple students were absent from group work (VK, 31) due to whatever reasons. Even worse, sometimes he had the feeling that "individuals deliberately behaved stupidly" (ib.) so they need to contribute less to the group work.

6.4. Teams experience manifold challenges at d.school

In short
To identify critical factors for the Design Thinking student team process, the biggest challenges in this process were questioned. Challenges arise from the way how different working values and norms are dealt with, how teams develop and organise their leadership and how they motivate each other and learn from their experiences. Knowledge handling is also an important aspect to incorporate different team members' expertise in a beneficial way. Due to missing formal statuses, student teams are less susceptible to status issues than executive teams.

One of the most relevant sections of this thesis is the analysis of team experiences and challenges

Dimension	Area	Examples
General	Previous experience	All students have previous project work experience
	Group work in academic studies	Too little group work in studies Group work instead of team work (efficiency-focused, evaluated, no team process, workload distribution, getting job done)
Structural	Group structure	Limited creativity and innovation potential (all group members have same background)
	Group process	Workload distributed uneven (most experienced do most of the work, inner circle - outer circle, some people participate, some not) Competition for groups and between group members (First come - first served assignment, get left over people that do not fit together) Multiple students absent from group work (illness, other reasons, individuals deliberately behave stupidly)

Table 6.3.: Group and team work experiences in own studies (participant view) – Source: Own depiction

that students and staff members have underwent during their d.school time. To derive relevant factors for team work, the biggest challenges were asked for. These can be grouped in two dimensions – team experiences / challenges and knowledge handling.

6.4.1. Working values, leadership styles and motivations influence student teams

Within the dimension of team experiences and challenges, four areas were defined to cluster the results: Working differences, working together, individual aspects and a short excursion on student versus executive teams. Table 6.4 summarises the findings.

On working differences, interviewees stated that challenges throughout Design Thinking projects are different commitment levels of team members (HN, 49). These can be time-wise (PK, 42) meaning that different team members have different time contingencies. Some students are bound by their student jobs and regular studies while others move to Potsdam or Berlin specifically for the Design Thinking programme. This can lead to a lower level of positive energy among the team members that put more time into the d.school education programme (HN, 19). This argument goes along with different working values and norms that can be present among team members (HN, 17). Some team members have no problem with showing up later or stretching deadlines flexibly (ib.). This makes the team process "hard if you feel like you cannot rely on other people you depend on because you have to work with them. I think so it affected the positive energy in the group" (ib., 19). Equally important, the non-attendance of team members has a huge influence on the team process. KP told that "it's tough on the team when you're missing and it's also tough on team to reconnect you back into the flow." (KP, 31). Because Design Thinking lays such a strong focus on team work, these interruptions are perceived as detrimental. They can even be very subtle, for example if a team member was not able to participate in multiple

track days, she could be updated but still is likely to not have all the details and experiences present the other team members have made. So chances increase that she either might feel lost in some discussions, raise points that have already been dealt with or cannot understand why certain decisions were made. KF, KP and HN stated that from their perspective the missing days of team members were too high.

In the way of working together, different development speeds of team members can occur (SK, 43). For example, students "who grow up in a society, in an environment where it's even unpolite to ask a question to the teacher [...] may need just longer" (ib.) to grow creative confidence than others. These students can feel alienated at the beginning "if everyone is discussing and everyone is able to bring themselves in and to make [...] all of that and that [they] may still feel like they cannot say something [...] that contradicts something" (ib.). Additionally, teams are confronted with the area of tension between their team's expectations and their project partner's expectations of the project (PF, 67; KF, 38). This sets in with the six week project in the Basic track and is also present in the twelve week project in the Advanced track. KF notes that these tensions influence the balance inside the team between pleasing the project partner and heading for "more crazy wild ideas" (KF, 38). Another challenge is that the Design Thinking programme attracts students that are more project drivers and alpha leaders. When multiple alpha leaders work together within an egalitarian team setting where no one owns a formal status, the risk of charismatic domination arises (PF, 68). It is then important for the coaches to prevent team split ups so that different team members work on different tasks on their own (KZ, 60; AQ, 46). Also the process-wise and opinion-wise split up within a group is detrimental when different team members try to push through their way of thinking (AQ, 46). PK stated that for her the question of "how you cannot have one person be the designated leader in the group [...] is the hardest problem" (PK, 86). Instead of this, a shared project ownership shall be strived for. The team shall jointly feel responsible for the results to get things done together (ib.). The goal is to reach a state of shared leadership among the team members. This necessitates a good coaching relationship, for which in turn a continual availability and attendance of the same coaches is necessary (SK, 41; AQ, 54).

One team challenge on the individual level is that in times were the project becomes hard, team members need to motivate their fellows while remaining motivated and energised themselves (AQ, 48). To survive these phases, AQ indicated that it "was really important to also meet outside to have at least a good team motivation" (AQ, 48) to remain motivated for the project work. Another challenge is to find the balance of handling personal issues within the team process in a meaningful way. One should not "bring personal issues on the table all the time" (SK, 41) although the team needs to be informed of important circumstances in one's life that might lead to a different behaviour of oneself. The aim is that one does not "destroy the workflow just due to your personal issues" (ib.) and the challenge is to mention the issues in a constructive, informative way. Furthermore, AQ stressed that one can feel demotivated if one is judged for everything once it was said (AQ, 47). Often the judging person does not even realise this and once AQ spoke to him about the issue he was "really surprised as well and said 'Oh, I didn't meant that and I don't

want to give people the feeling like this"' (ib.). She learned from this that one "should be brave enough to say in the moment in a team what is right or wrong or how I'd feel" '(ib., 48). The last aspect in this area touches on the reflection of ones behaviour throughout the Design Thinking team process. In the case of AQ, she had in one project a fellow team member that had a similar behaviour to her in the sense of naturally speaking too much in a group. Through this reflection she experienced how other people do normally feel when she demonstrates this behaviour. They were able to balance out each other and she learned to change her behaviour (AQ, 47).

An interesting side aspect was raised by PF. He is also responsible for the HPI Academy, the professional training division of the d.school focused on executive education. He stated that the kind of leadership problems and team dynamics in student teams are far less than in executive teams. He explained this with the circumstance that "none of the students here have any formal status" (PF, 68). In executive teams, however, you are likely to have "all sorts of status issues" (ib., 69), particularly if the boss is present and not a "really cool boss that says 'Come on guys, let's do this"' (ib.). Compared to student teams, "you have issues of gender, you have issues if you have mixed teams of seniority, [...] and that really is very, very difficult to deal with" (ib.). That can be detrimental to any team work if "they don't accept each other as equal team members" (ib.).

6.4.2. Knowing more is no problem, but knowing better is

> What makes it sometimes difficult is not that somebody knows more but somebody knows better. (EW, 105)

An important aspect of the daily Design Thinking team work is knowledge handling among team members. This means that there is a constant flow and exchange of different knowledge and opinions between the team members – and team members bring in different expertise. Both students and staff members were asked how they deal with these differences, especially in the way that team members with domain knowledge block creative discussions with their previously gained knowledge. A typical statement for this could be "I'm an expert in this area and it will never work in the way we are currently discussing. So we must do it in this way."

First of all, HN noted that one should not feel good or bad about having specific domain knowledge as one a team level the expertise of different team members balance each other (HN, 23). EW stated that often the staff members do not know about or realise certain expertise among students. Once discovered or mentioned, students are encouraged to make their relevant knowledge accessible not only to their team but also to the whole class (e.g. one student was a psychologist and introduced different psychology tests, another student offered career development advice (EW, 104)). She mentioned that there is nothing bad about having specific expertise as long as one knows more and not knows better (EW, 104).

When someone in a team thinks that he or she could lead the project in a certain direction, usually the team gets stuck (AK, 40). This is due to the fact that multiple strong characters

Dimension	Area	Examples
Team experiences and challenges	Working differences	Different commitment levels (time issues, different outgoing levels) Different working values and norms (show up later, stretch deadlines, no reliance on team members) Team members non-attendance (interrupting team process, on-boarding and updating time-consuming)
	Working together	Different development speed (cultural imprint, personal attitude and character, action- vs. planning orientated) Project partner versus team expectations (process, level of idea wildness) Multiple alpha leaders in a team Individual work and team split up (process-wise, task-wise, opinion-wise) Shared leadership (getting things done as a team, avoidance of one designated leader, risk of charismatic leadership) Regular coaching (continual team-coach relationship)
	Individual aspects	Motivate each other (remain motivated, do social events beside project work) Handle personal issues in a meaningful way Courage to mention important feelings at the spot (e.g. feeling or being judged) Reflection on ones behaviour (similar team members, continuous feedback)
	Student versus executive teams	Team dynamics far less complicated in student setting No status issues in student teams
Knowledge handling	Different knowledge and expertise	No reason to feel bad for not having a specific domain knowledge Knowing more versus knowing better Incorporate different knowledge and expertise for whole class (challenge of discovering expertise)
	Limitations	One thinks, others follow not effective (multiple strong team members pushing ideas and expertise, getting stuck) Knowledge backgrounds determine opportunity space (hard to think outside team members' experiences)
	Handling differences	Verbalise team members' point of views Lead constructive and productive disagreements

Table 6.4.: Team work experiences in d.school (participant and institutional view) – Source: Own depiction

exist in each team each pushing their ideas and expertise and thus the "one thinks, others follow" (ib.) notion is not going to be effective. Coaches are sensitised to discover these patterns and provide a meaningful intervention. AQ raised an interesting argument stating that the knowledge handling depends "on whom you have in the team and also not only their roles and behaviours but what kind of knowledge they have" (AQ, 59). This is in the way that "the backgrounds of the people open the opportunity field in which you then develop your solution as well because [...] it's also hard to think out of the box of those backgrounds then" (ib., 61). Sometimes, one just naturally sticks to a team member's expertise as it makes prototyping and testing easier and if one does not pay attention one "the backgrounds of the people led your solution" (ib.). This is especially noteworthy as the d.school tries to encourage students to think out of the box – and even in highly interdisciplinary teams the sum of expertise seems to be some kind of limiting outer "meta-box" in which the inner "out of the box" thinking is taking place in.

Regarding the handling of differences arising due to different knowledge and expertise backgrounds, PK suggested that team members should learn to verbalise such situations. She described that "if Person A says 'Person B is stupid and doesn't understand how things work'. Person B says 'Person A is stupid and doesn't understand how things work'. That's where you have the problem" (PK, 82). She trains students to get to the point that "Person A can say 'Well, Person B is a business person so they'll seeing it really different from me and I don't agree"' (ib.) and vice versa, because "once you name it, often you can solve them" (ib.). The challenge is to arrive at this rationale because "we can see from the outside that the problem is that we have with biz person and the designer but in their hearts they're just feel that they're right and the other person doesn't get it" (ib.). Equally important, SK argued that a certain level of vivid discussions and disagreements is not necessarily detrimental because it can "be very productive and in generating successful solutions" (SK, 49). The condition is that the discourse is held "in a productive way and in a constructive way" (ib.).

6.5. The Design Thinking journey can be facilitated with six ideal coaching attributes

In short
Student teams are accompanied by coaches throughout their learning journey at the d.school. In general, students perceive the role of the coach as a helpful mean to support their learning and team process. A charter of ideal attributes of a coach was derived stating six ideal attributes, among them the ability to facilitate teams and provide the right amount and quality of interventions.

The d.school programme is characterised by short theoretical inputs where new knowledge (e.g. methods or processes) are introduced, followed by an immediate exercise to apply these learnings. To facilitate this learning process as well as the team work coaches accompany each team. Usually,

teams have one coach for each track day, thus two coaches in total. Interviewees were asked how they perceive the role of the coach in the Design Thinking education process. Responses were widespread and clustered in multiple ideal attributes of coaches. Table 6.5 highlights the ideal attributes and exemplary replies that led to these attributes. It is important to note that these insights are individual and subject to a specific team member - coach experience.

Firstly, AK introduced the notion that coaches shall have the "perspective of an involved outsider" (AK, 44) and try to support teams with different interventions (ib.). KF reported that coaches were not always present in the team but "somehow sensed when the team was struggling and then had the good idea what to do like maybe what tool to use to make a decision or how to proceed" (KF, 63). He would not go as far as to say that coaches should only be available on-demand (ib., 65) because sometimes "you don't see that you are really stuck". A coach can feel this and provide some input in these situations, but needs to be proactively observing the team for this. This intervention, however, shall not lead to the coach becoming the leader or manager of the group (KZ, 64). The role shall be limited to providing an external perspective and offering to lend a hand if asked for by the team (KF, 63). The role shall be rather subtle (KZ, 68) and appropriate to the team's means.

Secondly, coaches facilitate team learnings. Therefore it is important that teams are not protected or shielded from making failures and experiencing difficulties (SK, 46). This means that coaches shall not always intervene (KF, 67) to let teams learn how to stand on their own feet (ib., 63). By providing sparks of reflection (WZ, 25), coaches allow teams to reflect upon themselves. Therefore it is helpful if coaches verbalise specific situations and let the team find solutions to it. PK portrayed this: "Right now we have a situation where one person is in charge all the time. Whether this is ok or are there downsides to it? [...] how do you guys think this is working? Should we try some other things? Seriously, is it ok? You all say it's ok but is it really?" (PK, 89). Hereby the coach names the situation but not directly forces a specific solution on the team. Furthermore, PF noted the importance to balance out dominant team members as in egalitarian teams without formal statuses charismatic domination is likely to arise (PF, 68). WZ raised that this is also important for individuals to "have the feeling that the individual people and the team as a whole is just sort of growing to its potential" (WZ, 19). One way to support this is by encouraging "the more quiet ones to speak" (ib.) and to "challenge people so that they open their perspective and are open to other perspectives" (ib.). This goes hand in hand with trying to push teams tow their boundaries: "Don't be satisfied with x, dare to try a fancy observation method, dare to talk to like do analogous as a researcher that they just sort of push them to really go into the topic and really try out" (ib.).

AQ experienced a particular crisis when they had to reframe their challenge in the middle of the process. As this was the six-week Basic track project, the schedule was still very detailed (compared to the Advanced track). Nevertheless, the team had to "step out of this daily structure from the d.school" (AQ, 54) in order to "debrief and say who feels how and what is the feeling about going on and do we want to kill our first prototype or not" (ib.). This provoked the reaction that every couple of minutes, coaches came by demanding them to join back the schedule and

pre-defined process. So coaches got "really kind of pissed and said like 'yeah, if you don't want our feedback you don't have to' but we were like 'no, of course you can give feedback', but in the moment we need to work on that everyone is still on board and that we know what as a team we want to achieve and what is for us more important to go with as a first idea or with the next one" (ib.). They would have needed more flexibility in their case and ultimately received a coach that "gave us that time and then said to the other coaches, ok, leave them alone" (ib., 55). In addition, PF defined that it is the coaches job to say "Look, this is a school. You're here to learn. You're not here to provide surplus value to a firm" (PF, 67). This focus on using one's chance to learn about the process and team work can become blurred if teams become too focused on primarily pleasing their project partners (ib.; KF, 38). Interestingly, a too strong focus on pleasing the project partner cannot be in the interest of the project partner as the ideas may become less innovative (KF, 38) and user-centred.

Thirdly, a student asked for more guidance and structure in the on-boarding phase at the beginning of their Basic track (AQ, 54). In the beginning, one is in the "school project or university thinking" (ib.) and needs a bit more structure and support to become familiar with the Design Thinking process. This initial phase shall be "fast-paced on purpose" (EW, 93) so that individuals have not time to think about, be hesitant or become perfectionist (ib.), which seems contradictory at the first time. However, this contradiction can be resolved by accompanied a team with an appropriate support within the fast time of the beginning and - if really necessary - to temporarily slow down the process before coming back to the pace.

Fourthly, coaches shall be able to "find focus from time to time" (SK, 47) in that they bring the group together (KF, 69). Especially HN wished for more guidance to reach a joint team work motivation (HN, 38) because she had the feeling that her team was too laissez-faire and too much hanging out. It would have helped her if one coach had moderated the process of coming up with joint team working norms and values for her team. Another aspect in this area is that coaches need to motivate their team, either when the team has experienced throwbacks and is unmotivated or is experiencing other challenges. The goal is that team members become "change-makers" (EW, 33) after the programme.

Fifthly, coaches need to have an expert knowledge in Design Thinking and ideally in further domains (EW, 107). Therefore different backgrounds of different coaches are beneficial to the process (HN, 40) as different coaches can bring in different ways of thinking. KZ experienced an executive Design Thinking team coaching and realised that it was merely recipe-oriented (KZ, 73). He favoured the intuition approach at the student education over this very formal and strict proceeding.

Lastly, coaches need to be consistent in what they do and stay informed about their teams. As each team has two coaches (for each weekly track day one coach) it is important that these coaches perceive themselves as a coaching tandem (AK, 46) and they inform each other about the current team state (AQ, 54). A coach rotation (having more than two different coaches) shall be avoided whenever possible (ib.) and ideally the coaches stay in the group topic to shorten the time of updating them and bringing them back on board (AQ, 54).

Ideal attributes of coaches	Examples
Be an involved outsider (provide the right amount and quality of interventions)	Coaches not always present but there when needed (provide helpful ideas of what to do) Do not always intervene but observe team to intervene when needed Not leading a discussion Lending a hand if asked for by the team Play a subtle role (provide suggestions and help as appropriate to the team's means)
Facilitate team learnings	Let teams experience failure and difficulties (no permanent coaching, let teams begin to stand on their own feet) Provide sparks of reflection (verbalise specific situations, team reflection) Balance out dominant characters (Deal with charismatic domination) Allow individuals and teams to grow to their potentials (encourage more quiet team members, challenge people for new and other perspectives) Push teams to their boundaries Depart from programme structure if necessary (enable flexibility if needed) Reassure team members that they are here to learn (primary reason is not to provide value for project partner)
Provide onboarding experience	Support teams more in the beginning of Basic track (provide more structure and guidance to become familiar with the process) Fast-paced process in the beginning to let participants focus on the process (no constant requestioning possible, avoidance of perfectionism)
Find focus and motivate	Guidance to reach joint team working norms and values Not getting lost in details and bringing the group together Motivate team in case of throwbacks or challenges Inspire team members to become change-makers
Offer expert skills and intuition	Expertise in Design Thinking Different backgrounds helpful for different perspectives Free intuition rather than following strict recipes
Be consistent and stay informed	Constant communication and exchange with tandem coach Less coach rotation (two coaches during the project, allow team members to get to know the coaches better) Stay in the group topic (shorten time for updating the coach)

Table 6.5.: Ideal attributes of coaches (participants and institutional view) – Source: Own depiction

7. Success perception and personal development

Current students and staff members were asked for their success perception of the Design Thinking education. Three areas were analysed – the perception of the individual success, the personal development and the project partner.

7.1. Students perceive academic group work with joint task commitment, proper group agreements and a supportive environment as successful

In short
Interviewed students and applicants share group work experiences from their previous academic studies. Three success areas were mentioned supportive for better group works at universities: A joint task commitment, proper group agreements and a beneficial group work environment.

Regarding the group works that applicants and participants have experienced in their academic studies, they were asked for the circumstances when they (would have) considered these group works as successful. Three success areas arose: Task commitment, group agreements and group work environment. Table 7.1 summarises the findings.

The first important aspect is a joint level of task commitment because "it's hard if you feel like you cannot rely on other people you depend on because you have to work with them" (HN, 21). Especially a regular absence of team members is considered to have a detrimental influence on the overall group process and interaction (VK, 31). Even worse, VK experienced team members to "deliberately behave stupidly" (VK, 35) – presumably to have to do less. This leads to the notion that "all members strived for the best possible result" (ib.) and contributed their best efforts.

Group agreements are relevant as well – HN noted that it is important to distinguish "the working level and the personal level" (HN, 21) so that members can accept other opinions (ib.) without being personally offended. Moreover, different talents and skills help for reaching a good outcome, although a common understanding of working values is necessary to focus the energy on the problem solving and not on team dynamics and conflicts (ib.).

Dimension	Success areas	Examples
Academic	Task commitment	Same level of task commitment (all members committed, real team work, minimal absence rate) Each member contributes its best
	Group agreements	Work level and personal level differentiated (accept other opinions) Different talents and skills but same working values
	Group work environment	Mixture of lecture and discussions / exercises No grade-based motivation (intrinsic motivation, standing up for one's opinion)

Table 7.1.: Group work success perception in (previous) academic studies (applicant and participant view) – Source: Own depiction

The group work environment is the third aspect and VK experienced in East Asia that a mixture of lectures and discussions or exercises is very helpful for good discourses (VK, 32). In these groups, students had to discuss topics from the lecturers' inputs and to come up and present a common agreement on how they think as a group on a certain topic (ib.). The other aspect is that VK does not feel any grade-based motivation. He finds a topic "either personally interesting and stimulating" (VK, 40) or not, so it is rather the intrinsic dimension that drives his enthusiasm and motivation. AQ elaborated upon the reward of a grade by stating that "in university it's so much pushed towards a grade so even if you suffer that it's kind of rewarding if you at least get than an A or B" (AQ, 21). For her these grades were not motivating and even if the group work is not "really successful, still from the outside it feels like this" (ib.). This is in line with an extrinsic reward that might not be able to let someone feel intrinsically fulfilled. VK even went so far as to risk a lower grade in favour of "standing up for his opinion" (VK, 40).

7.2. Experiencing real team work for the first time is a huge success for d.school students

In short
The team experience at the d.school is very different to most group work settings in academic environments. Thus participants and staff members emphasised the team and idea success areas with important items like a positive team atmosphere as well as a common understanding and backing for the team idea – ideally among the team and the project partner.

In this interview sections, current students and staff members where asked when they considered the team work and the d.school programme as successful. To help interviewees forming a response a hint was given in the form that they should imagine how on the day of their final presentation they felt about their project. Most interviewees started to elaborate from this point backwards,

noting their most relevant success perceptions. Results are clustered into team success, idea and process success, project partner success. An overview is outlined in Table 7.2.

For team success, EW noted that the final presentation days are often emotionally touching (EW, 67). The track is successful if "everybody is really happy" (ib.) meaning "that the students were really proud of what they were doing [...] or confident" (ib.). This includes coaches that should feel and identify themselves as the co-creators and co-facilitators of the student outcomes. AQ noted that "in d.school you have from the beginning the feeling that the process and the team work is the most important thing. So you do not really care so much - or I didn't care so much about the results of which what idea we developed or whatever" (AQ, 22) and focused on the team work. This was for her successful when "you enjoy working together and you like to come the next day to work together and maybe even work in your free-time. So that makes it then successful that you actually gain friends - or at least working friends" (ib.). In team work, a common understanding is important as well (EW, 109) in terms of a joint problem, challenge and team division understanding (ib.). It is not always easy to balance out the aspiration for good team outcomes (in terms of project results) and also a good team experience (ib., 110). If this is managed, teams feel driven forward. Furthermore, AQ described her experiences throughout her Master programme in which she was afraid of presenting because of her own language abilities and because fellow students "would find the most critical question to bring me down" (AQ, 30). This detrimental factor is taken away for her at the d.school: On the one hand, because no grading is given for the project outcome. On the other hand, in d.school students and staff members try to support you, build you up and "bring your knowledge upfront" (ib.). "Whatever you present, and even if you would forget for three minutes what you want to say they would clap as it would be an Oscar and support you. So you couldn't really be afraid of the presentations" (ib.).

Regarding the idea and process success, KF felt a success once all of his team was into and behind their idea. This was not the case until close to the final presentations "because even with the second interim presentation where we presented three of our ideas or prototypes we were all not really happy with them" (KF, 55). The state of success emerged when "we had this new idea and then tested it and actually it got more clear and also it somehow made sense" (ib.). EW stated that a further success is if student teams do not only have a great final presentation performance but also have substantial content behind it (EW, 67). KZ, although generally very satisfied with the programme, would have wished to try out more radical and innovative ideas (KZ, 52). He felt that he had not used the whole potential and opportunities that the d.school offered. KP mentioned that for him the "tools are great. They're practical, they're easy to use, they're not that hard to comprehend" (KP, 37). He was very satisfied with the learnings and remembered that "multiple times when using a tool in the d.school, I said to myself like, oh, if only I'd had this thing when I was working on projects" (ib., 39).

The last dimension is connected to the external perspective of the project partner success. This will be elaborated upon later in this chapter. For the time being, it is an additional success if "the project partner gets [...] the idea, understands it, takes it also as something to be considered in the future" (EW, 68).

Dimension	Success areas	Examples
d.school (students)	Team success	Everybody is happy (students proud and confident of their projects, coaches feel as co-facilitators) Enjoy team work (working together and in free-time, coming next day, meet new people, exchange opinions, try things differently) Make (working) friends Common understanding about problem, challenge and team division Balance of good team experience and strive for good outcomes No fear of failing at the end (no grading, feeling supported whatsoever, not afraid of presenting)
	Idea and process success	All team members into the idea When idea got more clear and made sense Great show and content Tried out innovative / radical ideas Tools and methods valuable for own life / outside d.school
	Project partner success	Project partner understands idea and considers to implement it

Table 7.2.: d.school success perception (participant and institutional view) – Source: Own depiction

7.3. Coaches and programme managers perceive their job role as successful if they can support students in growing to their potential

In short
Coaches and programme managers were asked when they considered their job role as successful. Examples from three different areas were mentioned: The reflection side (students reporting about their learnings retrospectively), the personal and team development side (when students become more themselves and reflect their lives) and the team process side (when teams begin to act independently of the coach).

Coaches and programme managers were asked when they personally consider their job roles at the d.school as successful. This was interesting because it shows the institutional perspective on what they expect from and wish for the programme on a personal and emotional level. Results are in the areas of reflection, personal & team development and team process. They are summed up in Table 7.3.

A particular success field is reflection. For AK, getting positive student reflections is very fulfilling. Many students reported her statements like "'Oh, this semester has been such a great experience and now I know a little better what I want to do in the future' or 'I have a more open-mind

and it's been a great learning experience which was fun additionally"' (AK, 17). Oftentimes, staff members meet students again after some time and even then they often get very personal and sometimes touching feedback (SK, 23). So one of the biggest success is if students "really appreciate what we did here and [...] really let me or us know that they have the feeling that it's kind of a co-creative thing we did here. And if that happens I think we have achieved what we're supposed to achieve" (AK, 17). On the organisational side, this means that it is important to also take the learnings from the current term to make the next term even more successful (EW, 35).

The second success area is if coaches and programme managers can support personal and team developments. Having a good outcome is the one objective area, but for WZ it is more relevant to subjectively having "the feeling that the individual people and the team as a whole is just sort of growing to its potential" (WZ, 19). Therefore it is sometimes helpful to push teams out of their comfort zone (SK, 23; PF, 26) and to support students in having "their life radically changed" (PF, 26). In the big picture, this can mean to encourage students to become more responsible "citizens that can solve problems [...] [and] can go into corporations and ask uncomfortable questions" (ib., 28).

In the team process, PK found it important that people smile a lot and have fun in the programme (PK, 37). When students, coaches and project managers work hand in hand and they received a successful on-boarding into the Design Thinking Process, EW sees her job as successful (EW, 35). Especially towards the end of the Basic track and in the Advanced track, students shall become able to solve complex situations in creative ways on their own (PK, 35). The best result is if teams do not need coaches anymore (PK, 109) and become independently acting and deciding (SK, 23). If teams also have a good outcome and find radical and different ideas, this is even more fulfilling (WZ, 19; PK, 35). Working logistics (i.e. the course schedule, resources, events etc.) and students that demonstrate they have thought about asking questions before they do so round off the picture (PK, 36 ff.).

7.4. New thinking experience

7.4.1. Students are ready to show their own potential and thoughts in university but mostly find an environment not stimulating them

In short
In their academic background, students experienced mostly a blocking environment that did not facilitate a new thinking experience. However, students have a clear picture of what would need to be improved to foster individual and new thinking at universities, summarised as "open and free thinking in small groups" (VK, 56). With this embodied, many university formats would look quite different from today, but students are ready for this change.

Dimension	Success areas	Examples
Job role (staff)	Reflection	Positive and student reflection (great experience, clearer view of one's future, more open-minded, was fun)
		Very personal feedback, even years later
		Students appreciate what is done (co-creation perception)
		Take learnings from current term and improve the next term
	Personal / team development	Individuals and teams grow to their potentials (step out of comfort zone)
		Students reflect their life to change and become more themselves (support students in radically rediscovering and changing their lives)
		Encourage students to become more responsible citizens (ask uncomfortable questions)
	Team process	People smile a lot
		Students, coaches and project partners work hand in hand (successful on-boarding of stakeholders into the process)
		Students solve complex situations on their own (no need for a coach, confidence to do things independently)
		Students find radical, different ideas (good outcome)
		Students ask for help with clear idea of what one could do for them
		Logistics are working

Table 7.3.: Job role success perception of coaches and programme managers (institutional view) – Source: Own depiction

7. Success perception and personal development

An important part of the self-image of the d.school is to provide a space and opportunity for students to become more creative and innovative. This and the following section shed light on this aspect by analysing how applicants and participants experience their environment at their universities and at the d.school in terms of new thinking. The new thinking experience is defined as the experiences that individuals make in an environment with regards to new ways of acting, thinking or reasoning. These can be both directions – the reaction of the environment towards individuals showing new thinking attempts and the action an environment takes to let individuals gain new thinking experiences. The importance of the environment is highlighted by KY in stating that "any environment I'm in has either a positive or negative influence on me" (KY, 38). In this section, students are asked whether they felt stimulated or hindered to try out new things and what they would have improved in their university setting (cf. Table 7.4).

Interviewees experienced their programme structure in their universities as very pre-structured and pre-determined (KZ, 25; VK, 46). KZ noted that in his case it was always the process of "this topic with these people in this timeframe" (KZ, 25) and everyone is working in a pre-determined solution framework (ib.). This means that students have to create an essay or presentation on their own or in a group but that the boundaries how this essay or presentation shall be written or structured is so rigid that it's rather assembly line work than individuals' performance and achievement. KY elaborated upon the classroom setting that "blocks so much creativity and talents in so many people from expressing themselves" (KY, 44). University often fosters a unitary learning format although she thought that "everybody learns different, and I feel like I learn very much through [...] artistic, visual learning. And not so much sitting and listening" (ib.). Thus the prevailing setting does not allow for a consideration of different learning types and styles. KY also noted that universities mostly value the fit with a structure. "If my ideas didn't fall within that [structure], it wasn't valued as wow, somebody has a new perspective, it was valued as, oh, you didn't understand it. So you get a bad mark" (ib., 45). As a consequence, she has seen that this setting can crash people in their "self-worth and really bringing so many people down. And I've seen so many people from the beginning to end, how much they changed in a negative way" (ib.).

Regarding the role of university lecturers, KZ stated that he did not feel a motivation from lecturers to foster new thinking. Usually this fixed thinking (KZ, 29) and fitting with the structure (KY, 45) hinders students. KP raised that in d.school he was for the first time really able to prototype (although studying a Design course) because he was free to come up with any prototype even it was very rough and immature. In his study courses prototypes "had to always be on a certain level, otherwise like the professors would kind of like, are you serious, you use cardboard, that's no material we use" (KP, 18). VK extended this aspect by stating that he felt his lecturers even neglected very basic suggestions and ideas, even if the same learning goal would have been reached (VK, 46 f.).

Interviewees mentioned several improvement suggestions for the university setting. VK provided a suitable summary by wishing for more "open and free thinking in small groups" (VK, 56). To reach this, multiple aspects are considered as relevant: More social interactions, especially in more

group work (VK, 56), combined with a freedom to solve problems with whatever means as a group (ib., 49). Trying out new formats (e.g. an assessment training by recording simulated interview situations (ib., 51)) was considered as well as smaller lectures (59-80 instead of 500 students) and more discourses and discussions (ib., 56). KZ wished for more choices for topics in the area of psychology studies (KZ, 29) and KY told that "it's about accompanying, it's about empowering, it's about learning together with somebody" (KY, 48) that is important to reach an interactive learning environment which values individuals' uniqueness (ib.). Besides these improvements at a university level, also group members are asked to show more aspiration and take a shared ownership for their work (KZ, 29). Eventually, students shall not only be evaluated for the project outcome but also for the drive and courage they showed along the way (AQ, 30).

In sum, the university environment would look quite different with these improvement suggestions applied. PF reported that from his experience as a university lecturer students are ready for this new way and environment. He said about his experience with offering Design Thinking oriented courses:

> And at Jacobs with mostly business students [...] it sort of became self-selecting - so I got the students that were sent to me and then there were a bunch of students fighting to get into the course, not because I'm so great, [but] because they knew I was doing Design Thinking. Because it's a different way of learning which they really wanted to experience. That wasn't me having to convince anyone. It was me keeping them back – I would say: 'Sorry, the course is full'. So I don't think we have to convince people of this. People are very ready to come. (PF, 77)

7.4.2. Team-first and openness approaches of the d.school as suitable means for a new thinking experience

In short
While a classic university setting aims at transporting content and topics to the students, the d.school is at its base team-first. This new experience in an environment with entrepreneurial spirit, freedom for new solution paths and useful methods lets students broaden their horizons in terms of team experience.

In line with the previous section, this section focuses on the new thinking experience at the d.school. Experiences could be grouped in the participant and institutional view. Participants related to the experiences and changes they underwent while staff members focused on their understanding of the d.school's new thinking approach and how this is facilitated. Table 7.5 summarises the findings.

On the student side, HN recalled that the d.school "first of all [...] showed me a lot of things" (HN, 55) in terms of interdisciplinary backgrounds of her team members which broadened her horizon. KF liked the freedom to work with whatever persona or solution one wants (KF, 57), AQ

Dimension	Area	Examples
New thinking experience at universities	Programme structure	Pre-structured and pre-determined study setting (this topic with these people in this timeframe, pre-determined solution framework) Traditional classroom setting blocking creativity and talents (unitary learning format, no consideration of different learning styles) Fit with the structure is valued (misfit considered as did not understand and bad mark)
	Lecturers role	No motivation and opportunity to foster new thinking (fixed thinking of lecturers, sticking to structure) Neglection of basic suggestions and ideas
Improvement	Open, free thinking in small groups	More social interactions (more group work, try out new formats, smaller lectures, more discourses and discussions, more choices for topics) Support of new thinking (lecturers support out of the box thinking, allow new solution paths, take the risk of failing and encourage it) Lecturers support interactive learning (accompany and empower students, foster learning together, value uniqueness of individuals) More aspiration of group members (everyone shall find their topic thrilling, stimulate personal interest and motivation, shared ownership) Evaluation of students' drive and courage (rather than only the outcome)
	Individual readiness	Students are ready for a new way of learning

Table 7.4.: New thinking experience at universities and improvement suggestions (participant and applicant view) – Source: Own depiction

the openness of Design Thinking as a whole (AQ, 41) and KZ the entrepreneurial spirit that was re-awakened within him throughout his d.school time (KZ, 13). The very useful tools (KP, 37) and their direct applicability (KF, 57) allowed for an easy onboarding experience into the world of Design Thinking (KZ, 48).

On the institutional side, AK perceived that for the d.school and its programme "it's really crucial to be put in a setting that is so different from what everybody experienced at university" (AK, 15). University can be considered as topic- or content-first, while at d.school everything is directed towards team-first. This highly team-centric environment (SK, 39) is one cornerstone of the Design Thinking education, leading to intense team experiences and a constant feedback culture to improve the team work (ib.). The new thinking and learning experience already starts "with the space and then [...] making use of the space from the very first moment and convincing everybody to make use of the space" (ib.). Students are invited to make a new experience (PF, 76), therefore building an atmosphere of trust (PK, 78) is relevant so that students can feel safe to fail and to try out new approaches. To strengthen the learning experience, the Design Thinking programme and coaches push students beyond their comfort zone (WZ, 21). The means of coaches and programme managers to stimulate, engage and support students are manifold (EW, 90): For example, providing warm ups for team building and allowing students to open up their perspectives (PK, 78; SK, 39) or avoiding perfectionistic tendencies by doing things no one is good at (PK, 78). Additionally, the exchange with the Design Thinking community is stimulated by guest lectures, inputs and talks (EW, 90) allowing students to learn from previous Design Thinking students and professionals.

7.5. Students report to gain creative confidence and can apply learnings to their own lives

In short
Although many participants experience the Design Thinking education programme as the "right offer to develop oneself further" (KZ, 75), what does this mean specifically? The most relevant aspects for interviewees were to gain confidence in their own abilities and trust in their teams. Interviewees depict a clear image of how they can apply their learnings in their own lives, in a variety of areas and with an entrepreneurial spirit to change the world.

During the Design Thinking programme, students have the opportunity to reflect and develop themselves. Asked for what the most noticeable changes were and how they could apply the learnings for their own life, students reported different experiences. Table 7.6 provides an overview of the mentioned aspects.

The Design Thinking education programme can change one's motivational and self-beliefs. HN gained "the confidence that there is no right path that you have to know from the beginning, but that there's a possibility to create the solutions completely on your own" (HN, 56). She

Dimension	Area	Examples
New thinking experience at d.school	Student perception	Horizon broadened (different backgrounds, interdisciplinarity) Freedom / entrepreneurial spirit (work with whatever persona or solution, openness, allow oneself to fall into the process) Direct experience of new methods and tools (easy onboarding experience into Design Thinking, very useful tools)
	Staff perception	Different setting than at university (make use of the space and freedom) Team-centric environment (team experience, constant feedback) Invite students to make a new experience (build an atmosphere of trust, pushing students beyond their comfort zone) Stimulation, engagement and supported by coaches (warm ups, team building, opening up, do things no one is good at, avoid perfectionism) Design Thinking community interactions (guest lectures, inputs and talks)

Table 7.5.: New thinking experience at d.school (participant and institutional view) – Source: Own depiction

became less afraid of the unknown and learned that she does not have to do everything on her own but can trust in her team and connect with the right people to make the solution "so much bigger" (ib.). KF reported that he did not act very differently but that he got "more open and also interested to talk to people and [...] get to know what they really want, what they really need, so what's their passion" (KF, 59). He became more used to a "problem-solving way" (ib.) thinking "how can we do that" (ib.). This mind shift is accompanied through the constant team situation, interaction and reflection (SK, 39). KZ realised that his thoughts became more positive and he especially liked to learn to celebrate failure (KZ, 80). He was most excited when he had multiple situations in which he realised that he had had false perceptions of a situation or person (KZ, 68). "By realising this", he stated, "you know that you learned something" (ib.). For AQ, an important personal development was to learn that she should express her concerns and feelings on the spot. In this way, the situation can be changed instead of getting worse and worse due to concealing these concerns and feelings (AQ, 48).

In addition, students could apply these changes in their own lives. KZ said that before the d.school he had wished to do something that can improve the world but he rather had the feeling that this would remain a wishful thinking. After the d.school experience, this wish became a firm belief that he can actually change something in the world and make a living out of it (KZ, 14). The d.school might be able to improve the entrepreneurial confidence of its participants as well (ib., 13) and HN noted that she became more confident to start her own business (HN, 34) while KY actually wants to apply her future learnings for her own entrepreneurial ambitions (KY, 10).

Dimension	Area	Examples
Motivational / self-belief changes	Personal development	Gaining creative confidence (no right path from the beginning, less afraid of the unknown, create solutions completely on your own) Trust in team (not me alone but connecting with people in a team, discover ones team role) More open to learn and discover (other people and their needs, suppress inner critic, problem-solving thinking: "how can we do that", try-out and open mindset: trust in that there is something in the end - iterate - step-back) Positive thinking, celebrate failure (let's make something out of it, realise false perceptions) Express concerns and feelings on the spot
	Application own life	Improve the world and make a living (think bigger, one can make a difference, from wish to belief, entrepreneurial confidence) Alpha team experience Exemplary application areas (e.g. bring people together, cultural training, integration of foreigners into our society, community building process) Not able to study again in traditional university setting (not happy any longer)

Table 7.6.: Motivational and self-belief changes through the Design Thinking education programme (participant view) – Source: Own depiction

KY wanted to create a cultural education training or programme answering the question of how foreign people can be integrated into a society while HN saw the potential in the educational area and bringing different people together (HN, 75). Besides this, students learn to survive in teams full of alpha leaders (KZ, 60), a quality that is relevant in a professional context. KZ also noted that he would not be "able to work in normal university structures any longer" (KZ, 30) and he would not be able to be happy there after his d.school experiences.

7.6. Project partners are either Design Thinking experienced or unexperienced and latter ones are harder to deal with

In short
Besides students, applicants and staff members there is one group missing – the Design Thinking projects' project partners. Their expectations are indirectly analysed through student and staff member experiences in their interaction. It is shown that unexperienced project partners are harder to deal with as problems like misunderstandings and differing expectations arise. Unexperienced project partners often don't know what they can expect from Design Thinking and can quickly hinder student team process while experienced and long-term partners know of the benefits that students with an external perspective can provide for them.

What project partners expect from taking part in the Design Thinking education programme is a relevant side aspect for this thesis. Although the main aspect of the d.school relies on educating students and empowering them, the real world projects play a relevant part. The scope of this Master thesis not allowed for additional project partner interviews, but the perception of what their expectations are and how the interactions looked like were asked. Key topics mentioned by students and staff members are outlined in Table 7.7.

The first area considers unexperienced project partners that participate for the first time and do not really have any previous knowledge of Design Thinking. These project partners often do not really know what to expect (KF, 51). AQ told that her team "had an hard project partner that were not at all interested in what we were doing" (AQ, 48) leading to a challenge of motivating her team to continue. Some unexperienced project partners understand the "d.school as a place where creative students work or students work in a creative way and that they rather have something specific in their mind they want to get out of it" (AK, 31). This goes in line with perceiving the d.school as a sort of consultancy or agency which it clearly is not and cannot offer as well. In this case, project partners expect student teams to solve everything, having multiple foci in their work and come up with ready developed prototypes (EW, 73; AQ, 51). Oftentimes, partners did not have any time, resources or could not provide any effort (AQ, 50) and they are focused on how to make immediate money with the solutions (KZ, 52) and whether the solutions fit with the corporate strategy (ib., 54). This results in teams not being able to freely work and sometimes even limits the potential of the Design Thinking process (ib.; AQ, 50). It is also a challenge to balance these kinds of expectations with the team – leading to the question whom the team wants to follow: the process and learnings through Design Thinking or pleasing the project partner (KZ, 54). AQ summed up this notion by stating that their project partner

> wanted to have an innovation without change - so it's not possible (AQ, 52).

However, project partners that are unexperienced often open up and shift their perspective during their cooperation with the d.school (SK, 31). Thus in many cases, initial challenges even out over the time.

In the case of experienced project partners, these usually know what to ask for and what they can expect of the process and programme (AK, 31). They often come with a clear picture of which kind of help or support they need and may ask for a validation or help with their (new) ideas (WZ, 35; SK, 30). PK reported that they often "expect things they never would have been able to come up with" (PK, 58).

Big corporations sometimes seem to not be interested in the solution but rather in learning about Design Thinking (SK, 30; PF, 55). They are looking rather for a test of Design Thinking to evaluate whether they want to incorporate Design Thinking further in their organisations and to see what the method can do for them (PF, 55). PF demonstrated a strong opinion that German firms are very conservative and that "if they had a real problem, they wouldn't give it to a bunch of students" (PF, 55). Partly going in this direction, big corporations sometimes rather look for insights (e.g. a thorough market research) instead of perfect solutions "because this is just valuable stuff they can work with no matter what solution there was" (SK, 30).

In the social and public sector, project partners really need solutions (SK, 30) and organisations are likely to provide real and painful problems (PF, 55).

In general, all project partners expect a certain degree of professionalism of student teams. This means that project partners expect students to take them along the journey (PK, 58) and provide them with the ability to influence the process at key points (ib.). An appropriate and constant communication and exchange with the project partner is a logical consequence of this. Furthermore, some partners want to do something with the Hasso Plattner Institute (HPI) and the d.school in order to use that brand (WZ, 35; PK, 59), a goal that is not reprehensible if it goes hand in hand with a clear commitment in the Design Thinking programme.

Dimension	Area	Examples
Project partner expectations	Unexperienced project partners	Don't really know what to expect (new to Design Thinking, not really interested in what team does, creative students working on something project partners already have in mind) d.school like consultancy or agency (solving everything, multiple foci, ready developed prototypes) No time and resources / how to make money with it (feasibility focus, now implementable, fit with corporate strategy, limiting solution space, blocking other directions) Innovation without change (some don't want to invest much, easy solution) Often surprised by process, shifting expectations over time
	Experienced project partners	Know what to ask for and what to expect Validation or help with (new) ideas (never would have been able to come up with)
	Big corporations	Learn about Design Thinking (incorporate into own company, test what the method could do) German firms likely to not give real problems to a student team Insights (market research)
	Social / public organisations	Need solutions, provide real problems
	General	Degree of professionalism from students (bring project partner along the journey, ability to influence at key points, appropriate and constant communication) Do something with the HPI / Design Thinking (use the brand)

Table 7.7.: Project partner expectations of participating in the Design Thinking education as partner (participant and institutional view) – Source: Own depiction

8. d.school improvement suggestions and Design Thinking vision

In the previous chapters, different aspects of the Design Thinking education programme were analysed. In this chapter, the bridge is forged to the last remaining interview area – future perspectives mentioned by students and staff members. The improvement suggestions for regular university settings have already been described in section 7.4.1 on page 58. In this chapter, improvement suggestions and visions for the d.school Design Thinking education programme are analysed.

8.1. Team and programme organisation are important improvement areas for the future

In short
Although well established, participants and staff members had several valuable improvement suggestions for the Design Thinking education programme. Team organisation could be improved by more support if teams struggle and coaches could be in a more constant exchange with each other to provide a consistent coaching experience for the team. More critical feedback was asked as well, besides different toolboxes providing summaries of the magnitude of methods and techniques students learn in a short time. Programme-wise, more perspective shifting stimuli are suggested as well as formats to let the students do more, e.g. with a lower programme regulation in the Basic Track.

Although well established, participants and staff members had several valuable improvement suggestions for the Design Thinking education programme. Both current participants and staff members were asked for improvement suggestions of the Design Thinking education programme. Mentioned aspects were grouped in three clusters: Team organisation and coach interaction, content and challenges as well as programme organisation improvements. Results are depicted in Table 8.1.

In the first cluster, team organisation and coach interaction, HN wished sometimes for more structure and guidance from the coaches (HN, 38). Some of her team members wanted more to hang out together and socialise a lot while she wanted to also focus on the process and project. Personally, she "would have wished for a coach to say like guys, listen to each other. Like you

are here because you want to do it. Or like you're here because you want to work. So why do you just hang out all the time?" (ib., 45). A potential solution for her would have been a "formal framework .. like to be on time, to now you do like a stronger structure that allows you to be free within the structure. I think that would have helped us" (ib., 42). With this a different group organisation might have been possible (ib., 29). She also noted that a better coach-coach interaction would be beneficial because often "they gave us completely different directions so that on Tuesday we had one coach who said 'yeah, like that do that, do that' and then on Friday another coach who said 'yeah, no, I think that's like you're on a completely wrong track"' (ib., 40). This would necessitate that the coaches perceive themselves as a tandem and are in "constant communication with each other and also make up their minds what they say and think as a coaching team about what the team is doing" (AK, 46). Besides this, HN perceived the feedback she and her team received as "a little bit too much like it's great, great thing that you're doing" (HN, 66). She wished for critical feedback as well and to "get a feedback what was good, what was bad" (ib.) since most of the time coaches came in the end and said "whoo, I like your idea, cool" (ib.). This was partly compensated by the user-testings in the real world where "people will question a lot what we do" (ib.). But being trained and getting used to critical feedback earlier would have been helpful for her. Lastly, AQ raised the argument that the student interactions within a Track and especially between Basic and Advanced Track should be fostered. She organised a speed dating day because she wanted to get to know "all those inspiring [people] and maybe find people you want to start up with" (AQ, 63). This event and also a startup weekend at the d.school led to a skill and knowledge exchange and she suggested repeating these formats in future tracks. PK stated that also joint track days where both Basic and Advanced Track are in the building at the same day would be helpful for students to get the whole picture of the education programme (PK, 116).

Regarding the content and challenges, HN wanted more theoretical background in the Basic Track "to be able to repeat the process" (HN, 63) on her own. As she had only participated in the Basic Track so far, this suggestion has to be seen in perspective with the goals of the Advanced Track. These include the preparation for students to apply and fulfil the whole Design Thinking process largely on their own. Toolboxes in which different methods, warm-up games and (brainstorming) techniques are summarised were another improvement suggestion noted by two interviewees (KP, 37; HN, 63). From the staff member side, WZ was interested in more research into "how teams are set up" (WZ, 47) and to learn more about "what makes good teams" (ib.). This is a field of future research that PhD teams of the Hasso Plattner Design Thinking Research Program (HPDTRP) have already started to address. Eventually, PF, coming from a public policy background, wished for more challenges from public organisations tackling larger societal problems (PF, 83).

In the area of programme organisation, AK argued that the time has come to calm down the process in the sense of staying with the programme structure for some time and letting the programme settle a bit (AK, 61). For her, there is still a little bit too much programme-push and it is the right time to consolidate what has been achieved so far (ib.). EW added that now as the Design Thinking education programme and process has come of age, it is now the time to

think about "changing also the place and the space" (EW, 117). SK and AK argued for thinking about less programme regulation already in the six week project of the Basic Track: "Finding a way to be for the last project in basic track be open to students adapting the structure to their needs" (AK, 59), "give more responsibility to the students" (SK, 55) and "let them do more from the very beginning" (ib.). SK also suggested "even more perspective shifting" (ib.) since students are often still very much stuck "in varying their whole reality perception somehow" (ib.). For her, being innovative means to step out of this and "To really change, to really don't see a tree as a tree anymore but as I don't know a .. a newish thinking for the birth or whatever. You know just to foster this even more" (ib.). Furthermore, KP noted that language barriers shall be avoided in which project partners are not able to speak English when working together with international student teams (KP, 5). PK proposed more programme days per week (PK, 115) and SK a closer exchange and connection with other d.schools around the globe (SK, 57). Noticeably, KZ as a student wished for the continuation of the study fee (KZ, 85). As long as this contribution is a reasonable amount, he considers this fee as a sign of personal commitment to the programme and beneficial e.g. for the show-up rate of students. He also recommended to give future applicants the hint that they should not consider to apply for the d.school during demanding study or work life phases (ib.) in order to be able to dedicate the necessary time amount and mental commitment to the d.school programme.

8.2. Key visions of staff members are students integrating Design Thinking into their lives and a strong societal impact

In short
Staff members and coaches used the opportunity to share their vision for the d.school and Design Thinking. With the established programme at hand, they wished for students to integrate Design Thinking into who they truly are in order to inspire further places to become more open and innovative. To address problems of global scale and move people from hysteria to action, one interviewee wished for a stronger societal impact of methods like Design Thinking.

At the end of the in-depth interviews with staff members and coaches, these interviewees were asked for their individual vision for the d.school and Design Thinking. With this question, interviewees received the opportunity to detail their understanding and impression of Design Thinking and think in a broad scale. Three areas arose – personal development, institutional integration and societal impact vision. Key results are highlighted in Table 8.1.

For the personal development, PK described her vision as a programme where "students are combining what they know already with Design Thinking" (PK, 118). She thinks that "just teaching pure Design Thinking is not creating the people that we need to have out in the world" (ib.). Rather than focusing on the pure method the programme shall be about "integrating Design Thinking with who people already are, what they're already doing" (ib.) and creating not "one

specific kind of graduate but a program that makes a whole rainbow of different graduates who can all work together" (ib.). Thus she wants the Design Thinking programme to be more than a pure method teaching. EW then wished for students and staff members to "find - including myself - other places that are gonna be inspirational for them and that they gonna inspire. So it's more like handing over the fire [...] and taking it to other places" (EW, 116). Although the programme is already flexible and revised regularly, SK said that she "would like to be more radical sometimes. After a while [...] I think we could dare more. In many ways" (SK, 53). Hereby she meant especially points that were already mentioned in the improvement section (experiment more, give more responsibility to students, let students do more from the beginning (cf. ib.)), but also daring in general so experimenting in totally new ways. PF gave a perspective on this by saying:

> Otherwise the way we do things, I mean we're always - this is why I love working here - we're always changing things and experimenting and probably not quite as extreme as they do at the d.school in Stanford, but on the whole we [...] try things out. We're free to try things out and that's what makes it so fun to work here. So I wouldn't want to change that, you know that basic. (PF, 83)

With respect to the institutional integration, EW wished for Design Thinking to become "part of the DNA of the HPI, [...] part of the DNA of the university of Potsdam" (EW, 119). Although a dream – in the end there shall be "no longer a need for these kind of spaces" (ib.). This was, however, unrealistic and thus places like the d.school need to exist further and remain some kind of outpost at the edge to inspire others (ib.). PK described, that even on the relatively small Griebnitzsee campus in Potsdam, people are spread all over the place and mainly communicate via e-mail. So she envisioned "one big, beautiful, open space that we all shared together" to meet and exchange in person with people from within the Design Thinking context but also from other academic contexts (PK, 117).

The probably most far-reaching visions were articulated in the societal impact area. These aspects stemmed from PF who combined his public policy background with today's problems and thought about the role that Design Thinking could and should play in this context. One aspect was that PF wished for Design Thinking to become part of "a complex of practices in society" (PF, 85) to take more responsibility for problems that are due now and not in 10 or 20 years. For him, Design Thinking and particularly the associated mindset could be one way to move people from hysteria (and non-acting) to acting and doing something. To address urgent problems like climate change, refugee and migration flows or hunger he would love to have an open innovation lab in Germany that follows the exemplary one already existing in Sweden. In these labs, public policy problems are tackled by students and results are made open-source to become fruitful and beneficial for society in general. However, at the moment "that is so cool, I'm so impressed, only the Swedes could do. Only in the Scandinavian countries" (PF, 85) this would be currently possible.

Dimension	Area	Examples
Improvement suggestions	Team organisation and coach interaction	More structure and guidance if team struggles (formal framework, commitment agreement, different group organisation) Better coach-coach interaction (more exchange and updates, more consistency, regular availability) More "honest" feedback (also certain levels of critique, critical feedback already in d.school, prepared for real world testings) More track interaction within and between Basic and Advanced Track (e.g. speed dating, joint track days, skill and knowledge exchange)
	Content and challenges	More theoretical background in Basic Track Toolboxes (warm-ups, methods, brainstorming techniques) More research on what makes good teams More public policy challenges
	Programme organisation	Calm the programme (consolidation phase, change place and space) Let students do more (less programme regulation, more student responsibility, students do more themselves from the beginning, fit to individual needs) More perspective shifts (change perceptions how students see their world) Avoid language barriers (English speaking project partners for international teams) More programme days per week Better connection and interaction with other d.schools Keep up the study fee contribution Hints for applicants (e.g. avoid participation in demanding study or work life phases)
Vision d.school and Design Thinking	Personal development	Students combine who they really are with Design Thinking (more than a pure method) Handing over the fire (inspire further places) Dare more, experiment more
	Institutional integration	Part of the DNA of the HPI and University of Potsdam (innovative outpost at the edge, one common and open space for all DT people)
	Societal impact	Part of societal practices (take more responsibility for problems, actually address and solve them) Move people to act now (from hysteria to act and do) Spin-off an open innovation lab in Germany for public policy problems

Table 8.1.: Improvement suggestions (participant and institutional view) and vision for the d.school and Design Thinking (institutional view) – Source: Own depiction

Part III.

Discussion, implications and conclusion

9. Research results synthesis

The in-depth case interviews led to numerous insights and a broad range of interesting aspects regarding the current Design Thinking education programme. It is now to extract the core essence out of this body of knowledge and to synthesise it in an actionable and helpful manner. In this chapter, the important learning dimensions of the programme are displayed. These confirm the implicit knowledge of d.school participants and staff members - that the programme is about people, process and space.

The summary is presented in the following sections and in the Tables 9.2, 9.3, 9.4 and 9.5.

9.1. Motivation and understanding

The Design Thinking education programme has a wide reach and most interviewees had a personal touchpoint (e.g. friend or fellow) that promoted the programme. Besides getting to know diverse (background) but like-minded (design ambition and mindset) people, certain aspects of the Design Thinking skill- and mindset (e.g. openness, trial-and-error, being oneself) resonated with interviewees and led to an application for the d.school programme. Overall the programme is perceived as recommendable and interviewees willingly advise the programme to their friends, indicating that they are not unsatisfied with it.

Although no common definition of Design Thinking has been depicted by interviewees, their definitions revolve around the following core aspects: *diverse teams*, *collaboration* and solve problems in a new way (i.e. *innovative problem solving* - in a non-designer background environment).

9.2. Learning goals

Applicants expect to discover and understand the Design Thinking methods and want to learn how (diverse) project teams can be managed and organised. Some interviewees do also expect to be able to guide own Design Thinking projects and train others after finishing the d.school programme.

Key learnings and experiences lie in three areas: team experiences, Design Thinking and personal development. Multiple notions mention the importance of a productive team work and state how relevant it is to openly reflect yourself and to question your basic assumptions (even your world

Learning dimension	Key learnings
Design Thinking process	Process understanding User research and observations Synthesis Prototyping
Team experience	Successful work in interdisciplinary teams New thinking experience
Personal development	Mindset shift Gain empathy Emotional maturity / creative confidence

Table 9.1.: Important learning dimensions of the Design Thinking education programme – Source: Own depiction

view). In this nature, the Design Thinking programme goes beyond a classic training programme and invites participants to reflect upon and change their mindsets.

Naturally, the overall learning goal is that students understand the Design Thinking process and are able to apply it. The key learnings are to understand the process and especially learn about user research, observations, synthesis and prototyping in particular. Students learn about these through short lecture inputs followed by a direct application and transfer to their respective team or demonstration challenges.

However, as Design Thinking is team-first oriented (see section 7.4.2 on page 61) and thus highly collaborative in its nature in order to provide a new thinking experience for students, this learning can only be achieved within a team setting. Thus the team experience and learning to successfully work in an interdisciplinary team is the second learning dimension. This includes the experience and mastery of methods and processes in a team context.

Lastly, the personal development of participating student is an important learning dimensions as students need to be able to shift their perspectives, gain empathy for the users they design solutions for as well as for their team members and to become emotional mature to build up creative confidence, i.e. the belief in one's individual creative capabilities.

The learning classification scheme (cognitive, skill-based and affective) of Kraiger et al. (1993) did not provide for a differentiation between the Basic and Advanced track. Differences lie in the degree of independent team organisation: Coaches take them by the hand in Basic track projects; in Advanced track they need to do the planning and organisation on their own. Noticeably, the garbage can model provides a starting point for future discussions – proposing the d.school as an organised anarchy organisation.

9.3. Learning experience and facilitation

In their academic background, current students and applicants face different individual challenges. Notably, students missed an open discourse environment and experienced their study programme

as too structured and not opened for own thoughts and discourses. This underlines their motivation for the d.school programme, yet the openness at the d.school comes with a price tag: Students need to become resilient to stand the constant and ongoing reflection and feedback process. Besides students, also programme managers and coaches experience individual challenges in their daily student-interactions. Their challenges lie in handling emotionally charged situations, finding their right coach role and developing their own personality to deal with the job role as well as emotional and workload demands.

All interviewees share previous project work experience in their academic studies. No interviewee would call the academic experience a team work, some even do not call it group work but just work distributed among students. Challenges were especially the missing team experience, uneven workload distribution and the competition for group signup and the competitive situation within groups.

To identify critical factors for the Design Thinking student team process, the biggest challenges in this process were questioned. Challenges arise from the way how different working values and norms are dealt with, how teams develop and organise their leadership and how they motivate each other and learn from their experiences. Knowledge handling is also an important aspect to incorporate different team members expertise in a beneficial way. However, due to missing formal statuses, student teams are less susceptible to status issues than executive teams.

Student teams are accompanied by coaches throughout their learning journey at the d.school. In general, students perceive the role of the coach as a helpful mean to support their learning and team process. A charter of ideal attributes of a coach was derived stating six ideal attributes, among them the ability to facilitate teams and provide the right amount and quality of interventions.

9.4. Success perception and personal development

Interviewed students and applicants share group work experiences from their previous academic studies. Three success areas were mentioned supportive for better group works at universities: A joint task commitment, proper group agreements and a beneficial group work environment. The team experience at the d.school is very different to most group work settings in academic environments. Thus participants and staff members emphasised the team and idea success areas with important items like a positive team atmosphere as well as a common understanding and backing for the team idea – ideally among the team and the project partner.

Coaches and programme managers were asked when they considered their job role as successful. Examples from three different areas were mentioned: The reflection side (students reporting about their learnings retrospectively), the personal and team development side (when students become more themselves and reflect their lives) and the team process side (when teams begin to act independently of the coach).

In their academic background, students experienced mostly a blocking environment that did not facilitate a new thinking experience. However, students have a clear picture of what would need to be improved to foster individual and new thinking at universities, summarised as "open and free thinking in small groups" (VK, 56). With this embodied, many university formats would look quite different from today, but students are ready for this change. While a classic university setting aims at transporting content and topics to the students, the d.school is at its base team-first. This new experience in an environment with entrepreneurial spirit, freedom for new solution paths and useful methods lets students broaden their horizons in terms of team experience.

Although many participants experience the Design Thinking education programme as the "right offer to develop oneself further" (KZ, 75), what does this mean specifically? The most relevant aspects for interviewees were to gain confidence in their own abilities and trust in their teams. Interviewees depict a clear image of how they can apply their learnings in their own lives, in a variety of areas and with an entrepreneurial spirit to change the world.

Besides students, applicants and staff members there is one group missing – the Design Thinking projects' project partners. Their expectations are indirectly analysed through student and staff member experiences in their interaction. It is shown that unexperienced project partners are harder to deal with as problems like misunderstandings and differing expectations arise. Unexperienced project partners often don't know what they can expect from Design Thinking and can quickly hinder student team process while experienced and long-term partners know of the benefits that students with an external perspective can provide for them.

9.5. Future development factors

Although well established, participants and staff members had several valuable improvement suggestions for the Design Thinking education programme. Team organisation could be improved by more support if teams struggle and coaches could be in a more constant exchange with each other to provide a consistent coaching experience for the team. More critical feedback was asked as well, besides different toolboxes providing summaries of the magnitude of methods and techniques students learn in a short time. Programme-wise, more perspective shifting stimuli are suggested as well as formats to let the students do more, e.g. with a lower programme regulation in the Basic Track.

Staff members and coaches used the opportunity to share their vision for the d.school and Design Thinking. With the established programme at hand, they wished for students to integrate Design Thinking into who they truly are in order to inspire further places to become more open and innovative. To address problems of global scale and move people from hysteria to action, one interviewee wished for a stronger societal impact of methods like Design Thinking.

Dimension	Area	Chapter	Examples
Motivation and understanding	Students are motivated to participate	4.1	Find fulfilment, gain new perspectives, discover new things Design Thinking education aligned with own professional ambitions Meeting like-minded and motivated people from interdisciplinary backgrounds
	Students share the same basic understanding of DT	4.2	Collaboration and innovative problem solving in diverse teams
Learning goals	Students expectations are met	5.1, 7.4.2	Programme expectations met on the personal-, team- and programme-level (great experience, interesting and filling community, interesting challenges, open and free thinking, support for new ways of thinking, interactive learning) Learning expectations met on the content- and project-level (eagerness to learn about Design Thinking, project management capabilities) Personal development expectations are to strengthen one's creative confidence
	Key learnings are imparted	5.2	Team experience (work productively in an interdisciplinary team) Design Thinking process (process understanding, user research and observations, synthesis, prototyping) Personal development (mindset to become open and creative, gain empathic capabilities, emotional maturity)
Learning experience and facilitation	Students can solve challenges on their own	6.1	Students able to balance Design Thinking workload with main studies or jobs, organise themselves, learn on their own and in a team
	Programme clearly structured	6.1	Sequence of lectures based on each other, potential to adapt the structure to teams' needs Open discourse environment provided (no fear to fail, every team member encouraged to share thoughts and perspectives)
	Students are ready for the process	6.1	Manage the ongoing team and individual feedback and reflection, ability to question one's role within a team and adapt as necessary

Table 9.2.: Success factors for Design Thinking education and exemplary items (student perspective) – Source: Own depiction

Dimension	Area	Chapter	Examples
Learning experience and facilitation (cont'd)	Ideal team work experience	6.3, 6.4	Team environment (no focus on grades, open and stimulating environment, failing perceived as learning) Team structure (no limitation for creative and innovative potential, interdisciplinary backgrounds) No working differences (balanced workload distribution, everyone participating, no competition between group members, no perceived hierarchies or statuses, availability of team members) Working together (deal with different development speeds of team members, manage project partner and team expectations, manage multiple alpha leaders, establish shared leadership, receive regular coaching) Individual aspects (motivate each other and remain motivated, handle personal issues in a meaningful way, courage to mention important issues at the spot, reflection on one's behaviour)
	Knowing more instead of knowing better	6.4	Accept different knowledge and expertise (incorporate knowledge, no jealousy of somebody knowing better) Not following individuals' knowledge without reflection (not following one leader, try to think outside team members' experiences) Handling different opinions within a team in a constructive way
Success perception and personal development	Successful team work	7.1, 7.2, 7.5	Task commitment (all team members committed, each member contributes its best, intrinsic motivation present) Team agreements (work and personal level differentiated, shared working values, common understanding of challenge and team division) Team work environment (mixture of lecturing formats, no grade-focused environment, no fear of failing in the end, freedom and entrepreneurial spirit present, direct applicability of new methods and tools) Individual perception (everybody is usually positive and happy, enjoy team work, opportunity to make (working) friends, horizon broadened)

Table 9.3.: Success factors for Design Thinking education and exemplary items (student perspective) – cont'd – Source: Own depiction

Dimension	Area	Chapter	Examples
Success perception and personal development (cont'd)	Idea and Design Thinking success	7.2	All team members into the idea, ideas get clear and concrete, trial of innovative and radical approaches, methods valuable for own life outside d.school
	Motivational and self-belief changes	7.5	Students realise a personal development (gain creative confidence, trust in uncertain team process, more open to learn and discover, positive thinking and celebrating failure, express concerns in the team even if unpleasant) See application potentials of learnings in own life (improve the world, entrepreneurial confidence, dealing with alpha leader situations, apply in different professional or organisational fields)
	Project partner success	7.2, 7.6	Provides a real challenge the partner is facing Are opened to learn about Design Thinking and demonstrate sincere interest and support (do not see the programme as a consultancy or agency) Project partner understands idea and considers to implement it

Table 9.4.: Success factors for Design Thinking education and exemplary items (student perspective) - cont'd – Source: Own depiction

Dimension	Area	Chapter	Examples
Learning experience and facilitation	Dealing with emotionally charged situations	6.2	Inappropriate student behaviours, deep offenses Team conflicts and dynamics
	Grow into the role as coach or track manager	6.2	Job role (positive onboarding experience, appropriate strictness, dealing with uncertainty) Deal with emotional needs and stories of students Stand the high demands of students
	Ideal attributes of coaches	6.5	Be an involved outsider (provide the right amount and quality of interventions) Facilitate team learnings (support teams on their learning journey, let teams experience failures and throwbacks, push teams to their boundaries, encourage more introverted or silent team members) Provide onboarding experience (more structural support in the beginning of the Basic track, fast pace in the beginning to avoid perfectionism) Find focus and motivate (guidance for joint team working norms and values, not getting lost in details, motivate team members to continue, inspire team members to become change makers) Offer expert skills and intuition (share experiences in Design Thinking, provide different perspectives and methods, show free intuition rather than strict recipes) Be consistent and stay informed (constant exchange with tandem coach, limited coach rotation, stay informed about the group status and current topics)
Success perception and personal development	Support the Design Thinking learning journey	7.3, 7.4.2	Receive positive student feedback (reflection, personal feedback, students' appreciation, possibility to improve the next Design Thinking term) Support individuals and teams in their development (grow to their potentials, life reflection and becoming oneself, encourage students to become responsible citizens, invite students to make a new experience) Facilitating the team process (working hand in hand, students learn to solve complex situations on their own, students opened for radical ideas, providing necessary logistics, motivate and stimulate teams, encourage students to make use of the space and freedom)

Table 9.5.: Success factors to facilitate and enable the Design Thinking education programme (institutional perspective) – Source: Own depiction

10. Discussion

The research goal of this thesis was twofold:

1. Providing a first understanding of which learning dimensions stakeholders of the Design Thinking student education programme in Potsdam consider as important.
2. Providing insights when and why stakeholders consider their role and participation in the Design Thinking student education programme as successful.

In this chapter, answers and indications to these goals are discussed and elaborated.

10.1. Team work is the most relevant learning, followed by personal development and process understanding

In the Design Thinking programme, students are trained to become successful in interdisciplinary teamwork, collaboration and innovative problem solving. This is - from an organisational perspective - the core learning outcome of the programme. This research shed light on the perceptions of students and applicants and what they considered as important factors. The literature review and the research results led to four success dimensions that are relevant to research: motivation and understanding, learning goals, learning experience and facilitation, success perception and personal development.

According to the present results, a Design Thinking programme needs to address all four dimensions to be perceived as successful. These dimensions, however, are rather theoretical and abstract constructs. Thus examples and aspects for each dimension are proposed and outlined in Chapter 9. These show in detail, what students and staff members understand by each dimension. Since the assumed dimensions from the literature review were supported, no ground-breaking surprises did emerge. The nature of this study became rather descriptive in the meaning that a thorough walkthrough of the current programme perception is provided.

Noteworthy, the initial understanding of learning dimensions was too narrow. The results showed that learning dimensions are only one element of the Design Thinking programme success perception. Accordingly, the learning dimension was mostly integrated in the success dimension learning goals. Another interesting point is that if the success dimensions and their underlying success factors are viewed cross-sectionally, the notion of team was predominant. It seems that stakeholders see this as the key element, to provide students with a real team experience and do everything to make this real team experience reality. The importance stems from the conviction

that for creative and innovative projects, more than one person is needed and these persons need to have a high quality of interaction (i.e. a mutual understanding, trust in each other, openness to share their perspectives). The team experience at the d.school was considered of much higher quality than previous experiences at university, where some interviewees did not even call these experiences team work but only group work or even just distributed work among students. The notion of a team and the success elements (i.a. work productively in an interdisciplinary team, shared eagerness to learn about Design Thinking and solve the project challenge, failure embraced and tolerated, accept different perspectives and integrate every team member) were important to most interviewees.

10.2. Students perceive the programme as successful if the team-, personal- and content-levels are addressed

The second research goal addressed the question of what success means in the context of the Design Thinking education programme. The research showed that the programme is perceived as successful if students experience a successful team work, work towards and achieve a meaningful project result, can develop their personality and can satisfy their project partner. Successful team work means that the team is committed to the task, team agreements were made, a proper team work environment is present and individuals perceive the team work as stimulating and positive. That all team members are into their joint project and the proposed solution is helpful for the project partner is the wish of current programme participants. The clear expectation to be able to apply Design Thinking to one's life and to be able to repeat and moderate the process on their own indicates that students do not only want to pass the programme. Instead of, they really want to take part, learn and develop themselves. This is also supported by the circumstance that the d.school does not frequently advertise its student programme and students come on an entirely voluntary base.

This clear expectancy and high demands of students are reflected in the depictions of coaches and track managers. They perceive their role as facilitators enabling students to grow into their full potential. Students shall discover who they really are and what they really want. They are provided with the opportunity to make failures and to learn from these. Hereby, the fear and anxiety of failures is addressed, one foundation for a discovery and try-out mindset. Staff members perceive their job role as successful when they receive positive student feedback during and after the programme. This necessitates that the expectations of students are met, otherwise complaints would be the feedback. The autonomy of students is fostered and students are encouraged to solve complex situations individually. As the focus lies on the student education, in case of doubt the student learning is considered as more important than pleasing the project partner. The ideal coaching attributes in Chapter 6.5 describe attributes for a coach perceived as filling its job role successfully.

Taking all results into consideration, it is hypothesised that

The Design Thinking student education programme trains students to become proficient in interdisciplinary team work. Team work is understood as collaborative and innovative problem solving among team members from diverse backgrounds. Students perceive the programme as successful when they learn how to work and manage interdisciplinary teams (team-level), how to develop their creative confidence (personal-level) and how to apply Design Thinking for future projects (content-level).

11. Research contribution and future research directions

11.1. The suggested success dimensions were supported

Cohen and Bailey (1997) , Mathieu et al. (2008) and Hackman (1987) researched factors for team effectiveness in professional settings. This dependent variable was influenced by a number of effectiveness dimensions. Cohen and Bailey (1997) stated the importance of environmental factors, design factors, group processes and group psychology traits. These dimensions were confirmed and relevant items for each dimension can be derived particularly from the ideal team work experience and successful team work perception (Table 9.3). The notion of team is a strong addition to the body of research as it is perceived as the overall success element of interdisciplinary and collaborative projects in the Design Thinking programme and likely also influences these settings in professional contexts.

It was proposed, based on the research of West and Altink (1996), that the individual motivation is a relevant factor for professional team innovation. This factor is confirmed for the Design Thinking education context and the notion of Rauth et al. (2010) that the individual's understanding of Design Thinking and his or her general wishes for and expectations of the programme play an important part, also in the personal development learning goal dimension. Mathieu et al. (2008) suggested several performance measures, behaviours and outcomes. Contrary to West and Altink (1996), they lay a focus on the notion of team and their team performance behaviours are supported also in the Design Thinking context (cf. Table 2.3). These behaviours were also described by interviewees in supporting the team experience. Performance composites and the viability outcomes that influence team effectiveness as well can also be supported in the Design Thinking education context.

For the learning goals, the learning classification scheme of Kraiger et al. (1993) could not be considered as a helpful mean. Although the Design Thinking programme aims at all three dimensions, interviewees reported that the learnings could not be attributed to a certain dimension of this scheme. The learnings are rather aiming at all dimensions simultaneously and the classification also does not allow discriminating between the Basic and the Advanced track. This is a meaningful hint for the current Hasso Plattner Design Thinking Research (HPDTR) project that uses this scheme to bring Design Thinking education to an open online course environment. It might be a different setting, but the learning goal dimensions of this thesis shall not to be directly neglected when transferring Design Thinking education to an online environment. This

thesis provides the academic world with a meaningful learning goal dimension scheme for Design Thinking education: The Design Thinking process, team experience and personal development.

Regarding the learning experience, the importance of the right environment, team experience and team facilitation is shown. This confirms the hypothesised notion that team work and team setting are important topics. The description of Hackman (1987) that group work should "enhance the capability of members to work together on subsequent tasks" is fulfilled for interviewees as shown by their answers regarding their perceptions of the programme. Although providing critical and insightful feedback on the Design Thinking education programme, all interviewees liked its base and their overall team experience. This is also strengthened by a strong Design Thinking community that spreads the word actively. Applicants and students were mostly attracted by word-of-mouth recommendations or previous workshops to the Design Thinking programme. That previous alumni considered recommending the programme shows that they were overall satisfied with the programme. That students with a previous Design Thinking workshop experience consider to get to know more about this method also indicates that their team experience cannot have been daunting. According to the interviewees, the d.school manages quite well to teach students to work together productively in interdisciplinary teams. This strengthens the academic evidence that Design Thinking as taught at the d.school in Potsdam is one promising way to foster team work and creativity alongside.

For the success perception, this thesis showed that the external success perception and expectation is certainly one relevant aspect, in the case of Design Thinking education external means mainly the interaction with the project partner. Hereby the professional research of Cohen and Bailey (1997); Mathieu et al. (2008); West and Anderson (1996); West and Altink (1996) is confirmed. The hypothesis that it is of equal importance to look at the success perception of individual students in their role as participants could be shown by their manifold comments regarding their positive and improvable experiences at the d.school. The hypothesis was amended by the successful job role perception of coaches and staff members and demonstrated further relevant insights into the education programme.

Overall, it can be stated that the indications of the meta-studies in professional contexts can to a large extent be transferred to the Design Thinking student education programme. Deviations are particularly present when profit or efficiency outcomes are noted. As the outcome (dependent variable) of the Design Thinking education programme is that students become proficient in innovative team work, the main outcome of organisations and corporations is usually externally-focused (e.g. making profit, serving human needs). Professional settings are mostly not designed to provide successful team work as a result but as a mean. In the Design Thinking programme, solutions and prototypes for external organisations and corporations are developed as well. But this outcome is the consequence and result of the training programme and not the core rational for the training programme. Insights from this programme, designed and focused to reach team work instead of traditional product or service outcome perfection, add interesting perspectives to the body of team research.

11.2. Future research directions

To sum up, this thesis extends the Design Thinking research by providing a rich and detailed description of how the Design Thinking education programme is currently experienced. First Design Thinking success dimensions are presented and valuable insights for current and future Design Thinking research projects are exhibited. The goal of this project was to capture a variety of aspects and show different perspectives on the current education programme.

The perspectives of multiple stakeholders were condensed in this thesis. The goal was to take all aspects into consideration and to provide an umbrella of perspective. These aspects were arranged and logically clustered beneath the four suggested success dimensions. The aspects were sometimes more elaborately mentioned and sometimes only noted shortly, leading to further research potential. For example, the ideal coaching attributes noted in Chapter 6.5 on page 50 can become the basis to substantiate the research about the role and behaviours of coaches on the team and success perception of Design Thinking programmes. Therefore, the summarised coaching attributes could be quantitatively assessed. Another example, in Chapter 7.2 on page 55, students describe their first experience of "real" team work. The transfer of this team work experience and collaboration to traditional university or professional settings is another interesting topic to research the influence of an improved team and collaboration setting on student satisfaction and grades. By taking the foundational results of this study, formulations of questions like in the mentioned examples can serve as a starting point for new Bachelor or Master Theses.

Future research can add upon these findings and construct an evaluation measure that might be of a more quantitative nature. As the results of this thesis are on the one hand very rich and detailed, they are on the other hand not generalisable. This is typical for qualitative research and appropriate to find a first starting point for future evaluation measures. A potential way to continue is to find quantitative and qualitative measures for the success dimensions and to validate these. After this, a (quantitative) survey can be a promising direction to generate results that provide a generalisable picture of the current state of the Design Thinking education programme at the d.school in Potsdam.

12. Implications

The discussion showed that several dimensions and aspects are considered as important success factors for Design Thinking education. What is especially helpful for the d.school is to understand how different stakeholders think about the programme and that they share a joint base understanding of Design Thinking. According to the interviewees, the d.school manages quite well to focus on the three learning goal dimensions (Table 5.2 on page 38). Personal challenges do not seem to be a big deal, however this dimension needs to be continuously monitored as a change at this personal level is going to affect also the team interaction level. Regarding the team challenges (Table 6.4 on page 49) it is advisable to even out the working differences at the beginning of a new team setup. With proper and joint working values, teams are more likely to master also critical team phases in a productive way. Hereby coaches can be sensitised for the different challenges like different development speeds of team members or team split ups due to individual work of some team members. These aspects for coaches are also inherent in the six ideal coaching attributes that may serve as a base guideline for the coaching training and supervision (Table 6.5 on page 53).

Traditional universities can look at many findings of this thesis in order to improve their education formats. Interviewees repeatedly noted they were unsatisfied with the interaction levels and quality of their lectures. As they considered the d.school an interesting addition and a promising experience, it can be argued that their dissatisfaction is rooted in their tendency towards new thinking, creativity, innovations and openness in general. The remaining students not being so proactive do not show up for the d.school programme and might be comfortable with how the programme is structured today. Pritchard (2004) suggested that many students might even want more structure. However, even if this would be the case, it is worth considering a revision of the education format for regular universities as they can gain additional potential and student interaction quality through enhanced group work. Trying out a new way of group work is in the beginning of course a risky endeavour, as is everything that is tried out for the first time. Nevertheless, when tried out in a proper format and with the willingness to adapt the format further and learn from feedback that students provide, this development can become very beneficial.

How can this development look like and which changes are necessary? First, a joint motivation and task commitment level is necessary (feeling committed to the task), followed by appropriate group agreements (same working values). Also a group forming process not build upon first come - first served is important (e.g. a moderated team formation) and a supportive group work environment (lecturing format, non-blocking environment)[4] are relevant. Starting to change the

[4]The sections 7.1 on page 54 and 6.3 on page 44 outline these factors in detail.

format with these aspects in mind, universities can take steps towards a real team experience. At the moment, students in this research consider their "team" work not even as group work but only as kind of distributed workload. Reaching these three base dimensions, universities can then start to improve upon the team experience fostering the team and learning success. Most examples like a positive team atmosphere and a common understanding and backing of the whole team process can be transferred from the Design Thinking context to normal education.

This team perception is also an important fact for companies. These, however, have to deal with even more challenges. Very often, organisations are hierarchically organised and these hierarchies are in the way of real team work. These formal levels of power lead to several status issues that get in the way of a free and open team atmosphere (see Section 6.4.1 on page 46). To circumvent this, team members especially in professional contexts need to accept each other as equal members when working together on a team project. This seems easy, but might be an endeavour that coaching support is needed for.

13. Research design reflection

The research design had certain strengths and limitations that are outlined in this chapter. The most important strength was its qualitative and explorative nature. The author does not know of any previous research on success factors for the Design Thinking student education programme and this thesis managed to provide rich and detailed insights. The in-depth interviews lasting from 35 to 90 minutes allowed interviewees to elaborate their answers and very limited interruption of interviewees was necessary due to time constraints. The open format of the first questions became a further strength, as interviewees provided new arguments and points for these questions that are likely to not have shown up in a purely structured format. The interdisciplinarity of interviewees, covering all relevant stakeholders, set the results into perspective and allowed for different point of views on the same success suggestions. These success dimension suggestions, based on an extensive literature review, can be supported by the results and did not seem to limit the participants in their responses. The interview guidelines were suitable for the in-depth format and some participants reflected upon the interview design that it was even helpful for them to reflect upon their Design Thinking experiences. Participants did not seem to be constrained by the interview questions and the time was provided that they could raise own topics and ideas. This confirmed the underlying assumption to formulate the interview questions as non-directing as possible.

On the limitation side, this study shares the limitations inherent to qualitative research. As a case-based setting was applied with a total of 13 interviewees, the results provide interesting thoughts and suggestions for future research. However, the results are not generalisable and readers need to pay particular attention when they leap to conclusions based on the results of this study. Although numerous insights were gained, further interviewees might have provided other and further success dimensions. In a future setting more interviewees could be involved, e.g. using questionnaires in larger groups in a workshop setting. Methodological these larger scale research could utilise the Delphi method to make use of the knowledge of a variety of stakeholders. Also interviewees from Stanford or further design schools around the globe might have set the results into a meaningful perspective. As the interviews took place within a limited time frame, the results are not longitudinal. Besides the success measure of the programme overall, re-assessing the perception in the middle of the track, at the end and some months after the participation can highlight the development of students and their perceptions throughout the programme. This thesis depicts the current state (beginning of 2016) of the student education programme in Potsdam. Regarding the research context, this study provides a starting point. Further research is necessary to substantiate the results and to develop a measurement for a larger scale assessment.

14. Summary and outlook

> Of the many diverse and fascinating challenges we face today, the most intense and important is how to understand and shape the new technology revolution, which entails nothing less than a transformation of humankind. We are at the beginning of a revolution that is fundamentally changing the way we live, work, and relate to one another. In its scale, scope and complexity, what I consider to be the fourth industrial revolution is unlike anything humankind has experienced before. (Schwab, 2016)

One may have a different stand to the notion of Klaus Schwab, Founder and Executive Chairman of the World Economic Forum. Whether the impact of current and future technologies - once fully realised - are as far spread as feared or maybe even more spread, the future will soon resolve. Apart from his extensive description of future economic and societal scenarios, it is interesting to see which kind of abilities humankind will likely need in the near future. As economies and societies become more complex in their nature and it becomes more demanding to reach a peaceful cohesion between the manifold stakeholders in a society, a certain type of personality will gradually become important. This is the integrating personality, meaning people that are able to understand multiple stakeholders simultaneously. They can combine different disciplines and take various perspectives into account. People with this personality will discover solutions that overcome borders and span bridges over emerging and lasting conflicts. Having read this thesis, the reader hoepfully agrees that the training in the Design Thinking education programme is one opportunity to promote the integrating capabilities in students.

This thesis began with the idea of capturing the current state of Design Thinking education and to identify potential evaluation dimensions. Looking back, this goal was not only achieved but also this thesis serves as an advisory report on topics that can directly be improved or looked at in the current programme. Further steps do now include an operationalisation of the success dimensions and an initial measure with a larger number of interviewees. The exemplary items for the success dimensions can point future researchers in promising directions.

In the scope of this Master thesis, a solid foundation was derived highlighting the current state of the success perception in the Design Thinking education programme. Key findings derived from literature review could be supported and fields for future research were indicated. A magnitude of aspects and insights is presented and can serve both as a future reference source and as a basis for further investigations. In making implicit knowledge of the d.school available to the academic society, researchers and individuals outside this subject area can gain a deeper understanding of the Design Thinking programme. Noteworthy, the four key dimensions (motivation and understanding

of the Design Thinking programme, learning goals, learning experience and facilitation as well as success perception and personal development) are supported to a degree that these dimensions can be individually examined to find suitable qualitative or quantitative measures for them.

The focus was mainly on the Design Thinking programme in Potsdam. Nevertheless, it is interesting to look at the role that methods like Design Thinking can play in a larger context. Design Thinking, broken down to its societal core, is one possible way how different people can work together to solve seemingly unsolvable problems in creative ways. On a public policy scale, these methods can provide a fruitful addition to tackle and address current challenges of global scale. By bringing people with different mindsets and opinions together and educate them in their empathic capacities and putting them in the shoes of others, these methods can provide a vital support for global challenges. Solutions strategies for social, environmental and economic problems like the climate change or the diminishing societal cohesion have such a scope that different stakeholders need to work with each other and not against each other. A future direction for Design Thinking might be to show its potential for these policy problems and demonstrate that the knowledge of how to address and jointly solve them is present. However, "knowledge isn't power until it is applied" (Carnegie, 2004) and it is the obligation of each individual in a society to step out of old patterns and prejudices.

Reaching the end of this thesis, PF's vision for Design Thinking is excerpted in full length. In a powerful and elaborated way, this vision sums up the potential that methods like Design Thinking can unfold if applied and followed by motivated and action-oriented people. If seed falls on fertile ground, large changes are possible. This vision shows the obligation each one of us has to make a change and impact in whatever way is possible and appropriate for him or her.

PF's vision for Design Thinking (PF, 85 f.)

"Well I hope it continues to evolve and I hope that we can continue to ... well, I really hoped that it can become part of a societal - what would I say culture too much - but of a societal of .. a part of a complex of practices in society where we take more responsibility for problems and actually solve them as citizens or as corporate citizens or as whatever. And .. I suppose this is getting close to entrepreneurial but I don't really mean that - I mean that - you know we take .. that we solve these problems that we are all faced with and let's say the moment the - instead of hysterically screaming about how terrible it is that we have all these refugees - why don't we use Design Thinking and things like Design Thinking to actually come up with some solutions that may help the people that are fleeing a war and destitution and poverty and crises and war.

Why don't we - instead of sitting there and belly aching and complaining about how the right is and how terrible the left is and how terrible blablabla - actually do something? I started my work twenty years ago so if we wrap it up and let's go back to the beginnings in climate change. Nothing has happened in climate change ever since I started my ((work)) .. that's hyperbolically as well - a lot has happened in climate change. But not really. If the whole idea of the climate agreement and the climate policy was to cut CO2 levels - nothing has happened, it got worse.

Hasn't even slowed. And I started work on this in 1994. Now that's really depressing. And my vision is that through Design Thinking - not just Design Thinking - through Design Thinking and many other things like it we can actually - we don't have to wait thirty years for solutions to problems that really need looking at now. Syrian children in - whatever that place was were they were sieged /Marmarita/ - are starving now. Ok, that's Syria, that's extreme, it's a crisis - but .. 20-30 percent of people in Southern Africa are HIV positive. Now. Now. In thirty years they're all dead.

We have a right wing Nazi problem in Germany, not just in the east but everywhere now. These things - we need to address these issues. And we're not going to address them by sitting there. We are not going to address them by getting hot under the collar about Köln ((Cologne)) on Silvester or whatever. We gonna address them by actually coming up with solutions. And this is one of the few ways I can see that we can actually start talking on it. Just finish that open lab in Sweden is the same as .. it's like a d.school but it only does public sector stuff. So it's got three universities or four. The big universities in Stockholm and the city of Stockholm and the county. And they all feed in these problems and they have students working on these public problems. As soon as they finished - rather than here when a lot of the stuff just disappears into proprietary - it's open source, so open innovation. So they put it on a website and everyone can pick the sub and run with it. Now that is fucking cool. That is so cool, I'm so impressed, only the Swedes could do. Only in the Scandinavian countries. But that's I think what we need.

And Design Thinking is one of .. I can .. what I see is .. I foresee many sort of communities that solve problems in either Design Thinking or future searches or deliberatively pooling or 'die Bürgerzelle' ((community of engaged citizens)) or whatever. And we have all this groundswell of people actually saying 'let's do this' with firms, with parties, and that would be cool.

That's my vision."

Part IV.

Appendix

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Bibliography

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A. Interview guidelines

The following interview guideline was used for the conduction of the in-depth interviews. To deepen the insights, the interviews were carried out semi-structured, thus allowing space for interviewees to raise important aspects in more depth and for the interviewer to ask for side aspects arising throughout the conversation.

Three interview guidelines were used, the first for the coaches and staff members (institutional perspective) is depicted in Table A.1 and A.2. The guidelines for current students and prospective students (interested applicants) both have the student perspective, but the former one asks for experiences within the d.school programme while the latter one asks more for the relevant experiences for design and innovation in their academic backgrounds in the absence of d.school experiences. The guideline for current students is shown in Table A.3 and A.4. The guidelines for prospective students are mostly identical with the ones of current students and were only adapted insofar as questions about the programme itself were left out or adapted to a hypothesis (e.g. when would applicants consider their time at the d.school to have been successful).

	Interview aspect	Exemplary questions for coaches and staff members
Interview frame	Informed consent	Interview aspects and program function can be mentioned in the thesis, agreement to record and transcribe the interview, information that interviewee can skip and quit the interview at any time
	Goal of the study	My Master thesis is about getting a first understanding of success factors and effectiveness in Design Thinking education.
		So far, for example the recent study of Holger and Jan (Schmiedgen et al., 2016) focused on corporations and organisations and I want to look at the d.school itself - so the education student program here. And there I want to look at what students expect from their education here and also what you and the institution d.school want to teach the students. My interview is structured in three phases: First an introduction phase, then an open phase and then a structured interview phase regarding some aspects I found out that are relevant.
Motivation and understanding	Personal background / motivation (MU1)	Before we start with my interview I'm interested in getting to know your personal background better and I'm especially interested in your personal experiences towards Design Thinking and innovation. So could you please briefly introduce yourself, so your academic and professional background, what you did so far?
		When and what was your first exciting moment you had with Design Thinking that you thought 'Ok, you want to get to know more about Design Thinking'? What was your motivation to become a coach / track manager?
		And how did you learn from d.school? How did you get to know about this programme?
		What are reasons that you regularly hear from students why they apply for the d.school and take part?
	Understanding of Design Thinking (MU2)	From your current understanding, how do you describe Design Thinking to persons that do not know about it already? What do you tell them what it's like?
Learning goals	Key learnings (LG1)	And throughout their time - what do you think are two or three most important aspects that Design Thinking students here in Potsdam shall learn or experience throughout their time here?
	Learning goal dimensions (LG2)	I learned about three learning goal dimensions from PhD students who currently take part in the Hasso Plattner Design Thinking Research Program and try to bring Design Thinking to an online-course environment, that also deal with aspect of what are the objectives and goals of this course that people shall achieve in the end. And they told me that there are three different classifications of learning results present in literature and research. One of these is the *cognitive* dimension. So it's this very basic getting to know something new, trying it out in a kind of classic university way, someone is telling you how to do it, and you kind of do it for the very first time, then when you get used to something it gets *skill-based*, so it's more that you remember it automatically like you drive a car you don't think every time again how everything works but you just use it and it has become normal to you. And then in the third stage that it also changes you in an *affective* way, so that you change your motivational and emotional self-belief dimension. And where would you say does the Design Thinking education focus on? On which dimension or also time-wise is there a development between different stages you address throughout the track? Do the Basic and the Advanced track focus on different dimensions?

Table A.1.: Interview guideline for coaches and staff members – Source: Own depiction

	Interview aspect	Exemplary questions for coaches and staff members
Learning experience	Individual challenges (LE1)	When you think back of your academic studies, what were your biggest challenges there?
		In your job here as a track manager/coach you are in a lot of contact with students, what was the most challenging experience with students or with groups so far?
	Team work / team challenges (LE2)	What do you consider are the biggest challenges that appear in group dynamics? So group dynamics within teams that they have to cope with?
		And regarding the certain group dynamics within the group between the team members, what do the teams usually struggle most with throughout their time here in their interactions with each other?
	Team facilitation (LE3)	And how do you facilitate teams when they struggle there?
		Another aspect that is currently researched is the collaboration aspect which is highly encouraged throughout this programme here. How do you help students that arrive here with different special domains as their background to get this knowledge together in a way that they not say 'Ok, I'm an expert in this and it will never work in this way as we do it now. So either we do it this way or not so to kind of bring the expert knowledge in but in a hindering way'. [Building on the ideas of others, defer judgement during creative process phases]
		Do you think there is a set of ideal roles a coach shall follow or would you say it's up to everyone how he feels of doing it?
	Personal development (LE4)	When new students arrive here for a new term, how do you manage to open their minds? When students come here from a - usually highly structured - university setting in a frontal education or frontal teaching way, how do you prepare them here to become ready for these team experiences and high collaboration environment?
Success perception / personal development	Individual (SP1)	When do you consider your role as a track manager / coach as successful? That you feel 'Ok, I'm a successful track manager / coach'? When do you have the feeling that you are happy in doing your job?
		And when you're now at the end of a term and the last day with students is over, when are you happy and have the feeling that this term was great?
	Personal development (SP2)	When new students arrive here for a new term, how do you manage to open their minds? When students come here from a - usually highly structured - university setting in a frontal education or frontal teaching way, how do you prepare them here to become ready for these team experiences and high collaboration environment?
	External (SP3)	What do you think do the project partners usually expect in order to say that it's for them successful to have taken part here?
General	Program-wise	What are from your perspective the differences between basic and advanced track regarding the (learning) outcomes?
	Future perspective	What would be your wish / vision for the d.school if you could change anything?

Table A.2.: Interview guideline for coaches and staff members - cont'd – Source: Own depiction

	Interview aspect	Exemplary questions for current d.school students
Interview frame	Informed consent	Interview aspects and program function can be mentioned in the thesis, agreement to record and transcribe the interview, information that interviewee can skip and quit the interview at any time
	Goal of the study	My Master thesis is about getting a first understanding of success factors and effectiveness in Design Thinking education.
		So far, recent studies like the one of Holger and Jan (Schmiedgen et al., 2016) focused on corporations and organisations. I want to look at the d.school itself - so the education student program here. And there I want to look at what students expect from their education here and also what the d.school wants to teach you. My interview is structured in three phases: First an introduction phase, then an open phase and then a structured interview phase regarding some aspects I found out that are relevant.
Motivation and understanding	Personal background / motivation (MU1)	Before we start with the interview I'm interested in getting to know your personal background a little bit better and I'm especially interested in your personal experiences towards Design Thinking and innovation. So could you please briefly introduce yourself - so what your background is, what you did so far and things like this?
		When and what was your first exciting moment you had with Design Thinking that you thought 'Ok, you want to get to know more about Design Thinking'?
		Thinking back about your academic history, why did you choose your Bachelor study field?
		And what were your reasons to apply at the d.school and decide that you want to spend there two days a week for a term?
		When you spoke to other students, what were - or did you hear - reasons why they applied for the d.school?
	Understanding of Design Thinking (MU2)	How would you - from your experiences so far - describe Design Thinking to a friend that has not heard of it before?
Learning goals	Key learnings (LG1)	When you applied for the d.school, what your wishes or your expectations that you had that you wanted to learn there or to get to know?
		When you think back of the Basic / Advanced track you participated in, what do you think are the two or three most important things you have learned at the d.school?
		When you now think back of this time you have spent at the d.school, what was a learning that you did not expect in this way?
	Learning goal dimensions (LG2)	

Table A.3.: Interview guideline for current d.school students – Source: Own depiction

	Interview aspect	Exemplary questions for current d.school students
Learning experience	Individual challenges (LE1)	And when you think back of your academic studies you did so far, what was your biggest challenge you faced in your academic studies?
		And what was the thing you were most struggling with at the d.school?
	Team work / team challenges (LE2)	When you think back of group work or team work in your academic studies, what was there your biggest challenge? [academic group work perception]
		And what was the thing you were most struggling with at the d.school?
		And focusing on the team work at the d.school, so in the teams you were, what was there probably your challenge with team dynamics? So with the interaction of each other?
		Which experience did you have with the exchange of different experiences from the students that they bring into the team and to not let that kind of guide the group in a specific direction because you say I've learned this and I know it will never work when we do it this way. How did you perceive that? [knowledge handling]
	Team facilitation (LE3)	And throughout team challenges you experienced in your group, how did you perceive the role of the coaches?
Success perception / personal development	Individual (SP1)	When you think of a group work or team work - either at university or at the d.school - when do you feel happy with the results that come out at the end?
		And when you think back of your last team presentation day at the d.school, when was the moment that you really felt happy about the term that you spend and the things you achieved? When was this?
		And when you think of the things you learned at the d.school - are you satisfied with the knowledge and tools you got at the d.school?
	Personal development (SP2)	How successful do you think was the d.school in opening up your mind? How do you think has the programme influenced you? Did the programme influence your perception or mindset?
		And do you think that you can apply what you learned in your professional setting?
		If you want to learn something new, something you haven't done before, how do you usually approach this?
	External (SP3)	What do you think from your perspective, what were the expectations of your project partner? So what did they wanted to achieve with the project?
General	Future perspective	What would be your wish / vision for the d.school if you could change anything?

Table A.4.: Interview guideline for current d.school students - cont'd – Source: Own depiction