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Design Thinking-Based Entrepreneurship Education: How to Incorporate Design Thinking Principles into an Entrepreneurship Course

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ABSTRACT

One Question we Care About. In recent years, more and more people have started to look to the field of design for inspiring new ways of dealing with innovation challenges. Based on the still growing popularity of Design Thinking in the management field and early success stories of its application in entrepreneurship education, the question we care about is: *What can we learn from Design Thinking to enrich entrepreneurship education?*

Approach. This paper critically summarizes parts of the Design Thinking literature. Many of the ongoing discussions in Design Thinking show parallels to the current debate of how to best teach entrepreneurship in higher education. Therefore, this paper established conceptual links between these two fields and provides strategies for how to incorporate Design Thinking principles into an entrepreneurship course.

Results. The following nine key concepts from Design Thinking were identified to add value to the discussion about entrepreneurship education: Wicked problems, formalized Design Thinking process models, divergent and convergent thinking, iterations, T-shape, multidisciplinary teams, creative confidence, informed intuition as well as studio learning.

Implications. Design Thinking is a very accessible way of facilitating multidisciplinary learning. It provides entrepreneurship educators with a number of important concepts, tools and methods that may be directly integrated into existing courses. The presented conceptual links between Design Thinking and entrepreneurship education provide new pathways for how to enrich current entrepreneurship education practices.

Value/Originality. This paper aggregates the recent literature on Design Thinking and transfers key principles to the domain of entrepreneurship education.

Key Words: Design Thinking, entrepreneurship education, pedagogy, curriculum design

1. INTRODUCTION

In recent years more and more people, especially from management practice, have started to look to the field of design for inspiring new ways of dealing with innovation challenges (Brown, 2009; Kelley & Kelley, 2013; Kelley & Littman, 2001, 2006; J. Liedtka & Mintzberg, 2006; J. Liedtka & Ogilvie, 2011; Martin, 2004, 2009). Design, as a holistic approach, is being described as a great way to enable and encourage innovation and growth within large organizations such as 3M (Porcini, 2009), IBM (Clark & Smith, 2008) and SAP (Holloway, 2009). Design connects and integrates a wide array of different disciplinary knowledge with the intention of solving problems (Buchanan, 1992). Martin (2004, 2009) argues that much of the existing management theory focuses on predicting and inferring stable courses of actions, based on available data from the past. Design on the other hand, acknowledges the inherent complexity of today's world and embraces the ambiguous, open-ended, ill-defined and wicked problems that come with it (Dorst, 2011; J. Liedtka & Ogilvie, 2011; J. M. Liedtka & Parmar, 2012; Stewart, 2011). The design process is always iterative in nature, which means that problems and potential solutions are constantly being framed and re-framed to explore multiple paths and options (Brown, 2008, 2009; Dorst, 2011; Kolko, 2013). Designers use abductive logic to focus on "What might be?" and envision radically new products, services and systems without having definitive proof for their success (J. Liedtka, 2000, 2014; Martin, 2004, 2009). Decisions made during this process centre on the latent needs of the potential end user(s) of a solution (Brown, 2008, 2009; Grots & Pratschke, 2009; Norman, 2011). Analytical tools and frameworks are merged with intuition into a "designerly way of knowing" (Cross, 1982) to guide these decisions (Suri, 2008; Suri & Hendrix, 2010).

According to Stewart (2011) the focus of design has shifted from designing material things to immaterial things, such as systems and organizations. This contributed to design being given a more global and strategic role (Cruickshank & Evans, 2012). It has now become more common to see the application of design principles and tools outside of the traditional design domain, a movement often referred to as Design Thinking (Brown, 2009; Kelley & Kelley, 2013; Kelley & Littman, 2001, 2006; J. Liedtka & Ogilvie, 2011). Several authors from the management domain have therefore proposed that design should also be given more attention within management practice and education (Boland, Collopy, Lyytinen, & Yoo, 2006; J. Liedtka & Mintzberg, 2006; J. Liedtka & Ogilvie, 2011; Martin, 2005).

Since design continually expands and re-defines its meaning (Buchanan, 1992), defining the new movement of Design Thinking remains an elusive target. Many authors have stated that no universal definition exists today (Johansson-Sköldberg, Woodilla, & Çetinkaya, 2013; Kimbell, 2011; J. Liedtka, 2014; Rodgers, 2013; von Thienen, Noweski, Meinel, & Rauth, 2011). Design Thinking rather has several different context-specific meanings (Johansson-Sköldberg et al., 2013). This "rather loosely labelled box" (Leifer & Steinert, 2011, p. 152) contained different elements and dimension of design theory and practice borrowed from the "designer's toolkit" (IDEO, 2016) which are now available to a larger audience. Tim Brown (IDEO, 2016), the current CEO of IDEO, one of the forerunners in the popularization of Design Thinking, provides one of the more frequently used definitions:

> *"Design thinking is a human-centered approach to innovation that draws from the designer's toolkit to integrate the needs of people, the possibilities of technology, and the requirements for business success."*

The growth in popularity of Design Thinking has led to a growing number of available publications (Razzouk & Shute, 2012; Stewart, 2011), which were mostly written after the year 2000

(Johansson-Sköldberg et al., 2013). These publications are mainly aimed at practitioners, e.g. from the field of management (J. Liedtka & Ogilvie, 2011). Only few academic articles on Design Thinking in ranked journals are available.

This paper has three aims. First, it intends to enrich the discussion of entrepreneurship education by introducing nine selected concepts from Design Thinking. These concepts were chosen for their potential to add value to an entrepreneurship classroom. Second, the Academic Program for Entrepreneurship (APE) in Munich is introduced as a reference programme which already incorporates many of these described concepts in an entrepreneurship education setting. Third, strategies are provided for how Design Thinking elements can be implemented in other classrooms.

2. NINE KEY CONCEPTS FROM DESIGN THINKING WE CAN LEARN FROM

When examining the current literature on both Design Thinking and entrepreneurship theory and practice, one notices several parallel discussions. Table 1 shows nine key concepts that arise from the Design Thinking literature and provides the main reference sources that describe each concept. The third column provides a short description of how the concept might be implemented in an entrepreneurship course.

The following sections will go through each of these key concepts in more details.

Table 1: Overview of Nine Selected Design Thinking Concepts

Design Thinking Concept	*Main Sources*	*How to Implement it in an Entrepreneurship Education Course*
Ill-Defined and Wicked Problems	Conklin and Christensen (2009); Rittel and Webber (1973)	Provide students with wicked problems or help students to develop wicked problems for experiential learning projects. Use the six criteria provide by Conklin and Christensen (2009) as a point of reference.
Formalized Design Thinking Process Models	Brown (2008, 2009); Grots and Pratschke (2009); J. Liedtka and Ogilvie (2011); Meinel and Leifer (2011)	Chose a formalized design process model for your entrepreneurship course which allows students to break down the process of solving wicked problems (Gerber & Carroll, 2012). Each model should be viewed as a series of overlapping spaces and connected activities (Brown, 2008, 2009). They should not impede the experimental nature of Design Thinking (Skogstad & Leifer, 2011).
Divergent and Convergent Thinking	Brown (2009); Design Council (n.d.); Grots and Pratschke (2009)	Encourage students to use both divergent and convergent thinking. Creating choices and making choices need to be balanced.

Iterations	Brown (2009); Grots and Pratschke (2009); Leifer and Steinert (2011)	Iterations as feedback and learning loops should be encouraged throughout a project. Design Thinking is inherently non-linear.
T-Shape	Brown (2009)	Design Thinking-inspired entrepreneurship education should allow students to develop their expertise both in their "home" discipline as well as other fields.
Multidisciplinary Teams	Kelley and Kelley (2013); Kelley and Littman (2001, 2006)	If possible, teams should consist of students from multiple disciplinary backgrounds. This will increase their overall performance (Kayes, Kayes, & Kolb, 2005) and their capacity to collectively reflect their practices and learn from this process.
Creative Confidence	Jobst et al. (2012); Kelley and Kelley (2013); Leifer and Steinert (2011)	Divide the student's learning journey into several smaller projects and milestones to provide multiple "small wins". Fostering creative confidence takes time!
Informed Intuition	Cross (1982, 2004); Kelley and Kelley (2013); Suri (2008); Suri and Hendrix (2010)	Developing intuitive "designerly ways of knowing" (Cross, 1982, 2004) takes both time and deliberate practice. Informed intuition can also be developed by people originating from more analytic or "rational" disciplines.
Studio Learning	Doorley and Witthoft (2012); (2004); Welsh and Dehler (2012)	The physical learning spaces should be tailored to experiential learning settings to allow students to deeply immerse themselves into their projects and to increase their self-reflective capacity.

2.1. Solving Ill-Defined and Wicked Problems

Design Thinking is receiving increased attention for the kinds of problems it helps to solve (Stewart, 2011). At least initially, designers essentially treat all problems as "wicked" problems (Buchanan, 1992; Coyne, 2005). This term was first introduced by Rittel and Webber (1973) and has since received increased attention in design theory. It originated from a contemporary discussion about general approaches towards solving large-scale societal problems. It could also be seen as a counter-point to the trend of strictly scientific rationale and systems approaches towards problem-solving (Farrell & Hooker, 2013).

Conklin and Christensen (2009, p. 19) define wicked problems according to six characteristics. First, with wicked problems "[y]ou don't understand the problem until you have developed a solution”. Second, wicked problems do not have a fixed “stopping rule”, which implies that the problem is essentially endless. There is no “perfect” solution for wicked problems. Instead, you will work on the “best” solution until your resources, such as time, money or skill, have been used up. Third, solutions to wicked problems cannot be “right” or “wrong”. You can only assess if it is better or worse than currently available solutions. Fourth, essentially, every wicked problem is unique. Fifth, for wicked problems there are no given alternative solutions. Sixth and lastly, every solution to a wicked problem has consequences, as you can only learn about the quality of your solution by testing it live. Rittel and Webber (1973) argue that these criteria allow the separation of the field of design from other fields.

To clarify this term further, Rittel and Webber (1973, pp. 160-161) also contrasted wicked problems with what they called “tame” problems, which they define as follows:

> *“[The mission of tame problems] is clear. It is clear, in turn, whether or not the problems have been solved. […] For any given tame problem, an exhaustive formulation can be stated containing all the information the problem-solver needs for understanding and solving the problem …”*

Following the proposed classification in practice is not always easy. Conklin and Christensen (2009) admit that in reality, there are actually several “degrees of wickedness”. Nonetheless, the classification of problems as either “wicked” or “tame” allows for more precise descriptions of what kinds of problems are being talked about and has overall enriched the discussion in the field of design for many years (Xiang, 2013).

In a recent study using functional Magnetic Resonance Imaging (fMRI) Alexiou, Zamenopoulos, and Gilbert (2011) showed that the level of brain activity and the patterns of functional interaction between brain regions actually differ for ill-structured wicked problems and well-structured tame problems.

Most entrepreneurship problems may be considered to be wicked (Krueger, 2009). Founders do not really understand their customers fully, there is no fixed stopping point, the business can always be improved, there are no right and wrong answers – only best solutions, each business is unique, and you can never know you are right until you test your business in the real world.

2.2. Formalized Design Thinking Process Models

Several authors have attempted to formalize the design process as models and frameworks (Brown, 2008, 2009; Grots & Pratschke, 2009; Kelley & Kelley, 2013; Kelley & Littman, 2001, 2006; J. Liedtka & Ogilvie, 2011; Meinel & Leifer, 2011; Stickdorn, 2010). Breaking down the process of designing solutions to wicked problems allows (novice) designers a feeling of control as well as progress and removes some of the uncertainty inherent in these activities (Gerber & Carroll, 2012). It breaks down necessary activities into more manageable tasks and allows designer to dive deep into individual activities without losing track of the larger context of a project (Doorley & Witthoft, 2012). It is important to think of these models only as guidelines, not as prescriptive step-by-step instructions. Otherwise the benefit of the experimental nature of Design Thinking is lost (Skogstad & Leifer, 2011). Brown (2008, 2009) therefore deliberately describes the activities in these models as a series of overlapping spaces and connected activities.

One such model is the Double Diamond design process model by the Design Council (n.d.), shown in Figure 1. This model emerged from an extensive study of how designers in large innovative companies routinely innovate by design (Design Council, n.d.). This model very clearly distinguishes between the “problem space” and the “solution space”. Both need to be in harmony, i.e. the solution needs to fit to the problem, or slightly rephrased: A proposed solution will only be as good as the problem it addresses. This might seem obvious, but in reality this is often neglected by novice designers. Each space is further subdivided into separate activities which guide the design process without overly restricting it.

This process model may be contrasted with many entrepreneurship education approaches where students are often instructed to start with an idea (i.e. solution) rather than starting with a specific customer or problem. Thus students often come up with some idea in the first weeks of class and then write a business plan that seeks to identify potential target markets.

Figure 1: The Double Diamond Design Process Model

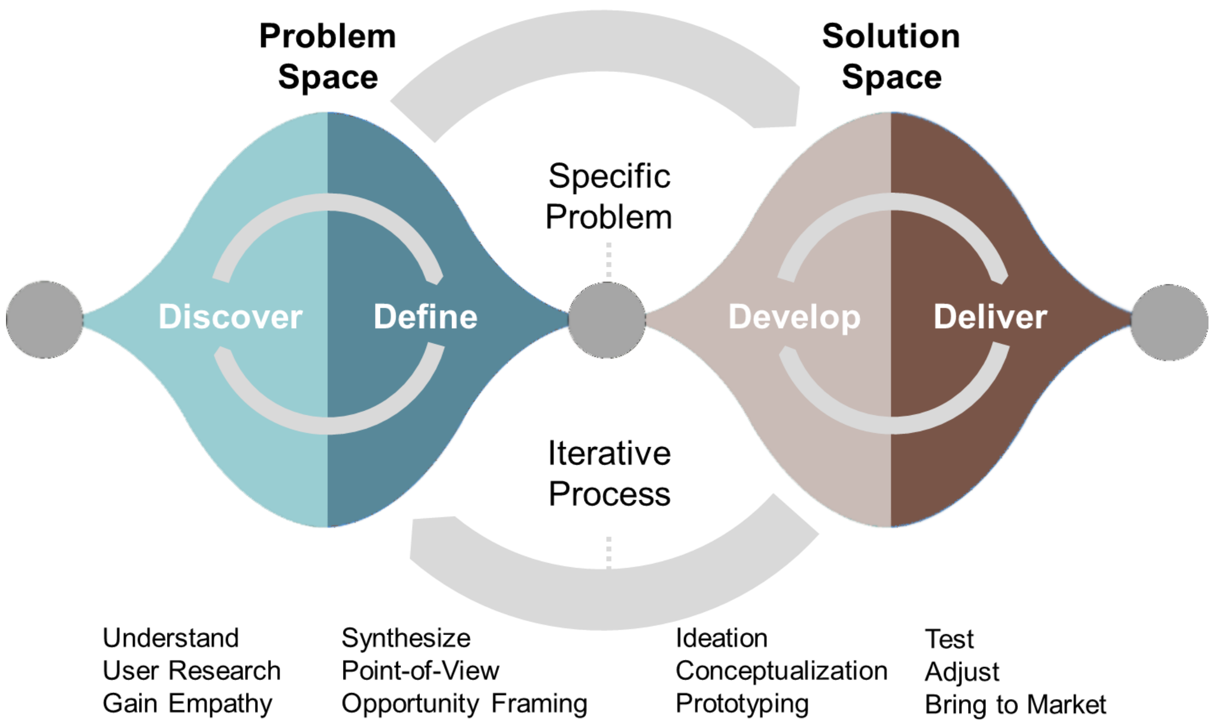


Figure adapted from Design Council (n.d.) with own annotations

2.3. Divergent and Convergent Thinking

During the design process, both divergent thinking and convergent thinking are used (Brown, 2009). It is important that these activities are clearly separated (Grots & Pratschke, 2009). Divergent thinking is concerned with the generation of multiple options. No selection or critical evaluation of data and ideas should take place during these activities. Likewise, convergent thinking is concerned with narrowing down choices and selecting options. These activities should focus solely on the available information. Experienced design thinkers switch rapidly between these modes of thinking during the design process.

In the Double Diamond design process model in Figure 1, both “discover” and “develop” describe divergent activities, while “define” and “deliver” describe convergent activities. Within the “problem space", the goal is to diverge and discover multiple insights and trajectories and gain a deep understanding of both users and context. This information is then critically discussed and interpreted to define a specific problem/opportunity to take forward into the "solution space". Within the "solution space" multiple ideas, prototypes and solutions are developed. These choices are then narrowed and adjusted to deliver a final concept.

In contrast, many entrepreneurship courses focus on the use of planning techniques which are inherently convergent in nature. They seek to reduce ambiguity by identifying target markets, proposing marketing strategies and specifying projected costs and revenues. The business plan traditionally aims to minimize risk rather than explore divergent potential opportunities.

2.4. Iteration

Almost all formalized process models in Design Thinking include iterative loops. Iterations emphasize the fact that the process of designing new desirable, feasible and viable offerings is always dynamic and therefore cannot be adequately condensed into step-by-step instruction (Gerber & Carroll, 2012; Grots & Pratschke, 2009; Leifer & Steinert, 2011; J. Liedtka, 2000; Rodriguez & Jacoby, 2007; Tonkinwise, 2011). A non-linear use of the formalized design processes enables designers to use iterations as feedback and learning loops (Brown, 2009; Gerber & Carroll, 2012; Kelley & Kelley, 2013; Rodriguez & Jacoby, 2007; Tonkinwise, 2011).

The Double Diamond design process model (Design Council, n.d.) acknowledges this fact. In its application, designers frequently iterate between the "problem space" and the "solution space" until a fit of both is achieved. Smaller iteration loops also occur within each space and symbolize the interplay of divergent and convergent thinking.

In traditional entrepreneurial planning-based approaches there are no iterations, merely the plan. This approach has been turned on its head by the newer "Lean" approaches such as described by Ries (2011), Blank and Dorf (2012) and Maurya (2012).

2.5. T-Shape

Design Thinking team members should demonstrate a "T-shaped" profile, a term which originated at McKinsey & Company (Brown, 2009). This means that each team member should have a solid foundation in an (academic) discipline, which is symbolised by the vertical line of the letter "T". In addition, each member should also have keen interest in other disciplines and domains, which allows them to bridge disciplinary boundaries. This is symbolised by the horizontal line of the letter "T". Developing such a T-shaped profile requires an inherent appreciation for self-driven learning, asking questions which might be obvious to others, constantly challenging each other's assumptions, listening to better understand, recognizing and accepting differences as well as taking responsibility (Adams, Daly, Mann, & Dall'Alba, 2011).

The importance of the team has been well recognized in the entrepreneurship field for many years. Everyone knows that investors will prefer "an A team with a B plan over a B team with an A plan", but what makes for an A team? In most cases, we seek to find teams that cover all the major functional aspects of a business – sales, marketing, operations, engineering, etc. Design Thinking also emphasizes the need for flexibility and domain bridging strategies and collaboration.

Figure 2: "T-Shape" Profile in Design Thinking

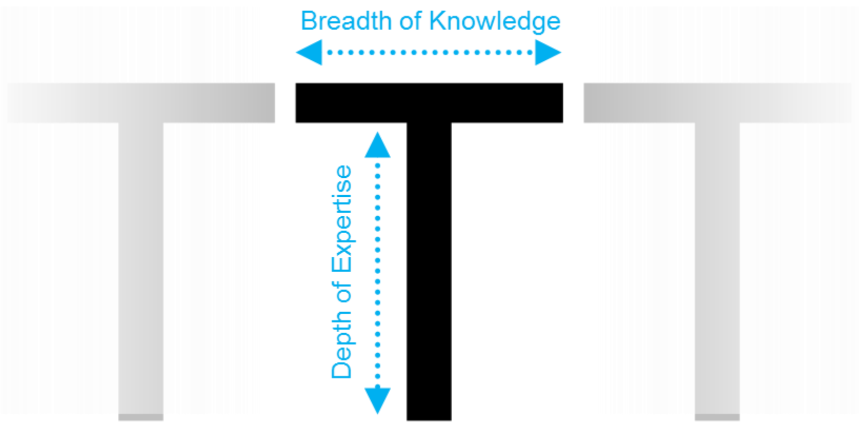


Figure inspired by Brown (2008, 2009) and Grots and Pratschke (2009)

2.6. Multidisciplinary Teams

The complexity of today's societal and business problems favour a team-based approach over disconnected individuals working on their own (Brown, 2009). Many Design Thinking authors suggest, that these teams should consist of multiple disciplines and character types, which allows teams to analyse situations and problems from multiple points-of-view (Alves, Marques, & Visser, 2006; Brown, 2009; Fischer, 2000; Kelley & Kelley, 2013; Kelley & Littman, 2001, 2006; Lockwood, 2010; Lojacono & Zaccai, 2004; von Thienen et al., 2011).

Several authors have noted that although working in multidisciplinary teams adds additional complexity and complications (Adams et al., 2011; Fischer, 2000; Kelley & Kelley, 2013), multidisciplinary teams generally outperform homogenous teams (Kayes et al., 2005). Nakui, Paulus, and van der Zee (2011) propose that this is due to a higher quality of ideas, not a higher quantity of ideas in multidisciplinary teams and that this effect is moderated by each team member's belief in the positive effect of multidisciplinary team settings. Several authors also agree that the performance of multidisciplinary teams depends in large parts on their ability to create a shared understanding about the goals and tasks of their project (Fischer, 2000; Gilson & Shalley, 2004; Kleinsmann, Buijs, & Valkenburg, 2010; Welsh & Dehler, 2012). Therefore, a willingness to work constructively with other team members is a prerequisite to multidisciplinary teamwork (Welsh & Dehler, 2012).

Picking the right people for a multidisciplinary team is difficult. Multidisciplinary teamwork needs to be "orchestrated" (Adams et al., 2011). In the context of the design innovation company IDEO, Kelley and Littman (2006, p. 83) claim that "[t]here is an art to putting teams together." Each team member needs to be able to contribute to a project (Eisentraut, 1999). Team size should be between three and six individual members (Wheelan, 2009). Based on their experience in teaching Design Thinking in various class settings, Beckman and Speer (2006) suggest that good teams will rotate leadership positions among the team members, based on where each team member's skill set might add the most value for a certain task in the design process. Dayan, Elbanna, and Di Benedetto (2012) note that a certain level of political behaviour, such as negotiating, bargaining and seeking power, is to be expected within such teams.

Creating inter-faculty entrepreneurship education courses is quite a challenging task (Turgut-Dao, Gedeon, Sailer, Huber, & Franck, 2015). Grass-roots initiatives are often bogged down by existing university structures, rules and regulations. However, the added benefits of crossing disciplinary boundaries for an inherently multidisciplinary subject such as entrepreneurship outweigh many of the additional administrative hurdles: Peer-learning is taken to the next level, individual and team reflexivity increase and students are better prepared for a work-life after graduation. Some new connections might even lead to new venture started together.

2.7. Creative Confidence

Creative confidence as a concept is being frequently discussed in Design Thinking since the publication of *Creative Confidence* (2013), the popular book by IDEO co-founder David Kelley and his brother Tom Kelley. According to Jobst et al. (2012, p. 35) creative confidence can be described as “one’s own trust in his creative problem solving abilities.” Creative confidence also refers to being comfortable, even embracing the inherent uncertainty and ambiguity which present themselves when dealing with ill-defined and wicked problems (Jobst et al., 2012; Kelley & Kelley, 2013; Leifer & Steinert, 2011). Creative confidence is not a distinct theory, but rather a contextualized adaption of the theory of perceived self-efficacy, initially proposed by Bandura (1977, 1982). He argued that a person’s individual context-specific belief system influences their ability to achieve their tasks and reach their goals.

Bandura’s concept of perceived self-efficacy is well known in the entrepreneurship domain and frequently used in assessments instruments. At the same time, creativity is often mentioned as one of the key learning goals in entrepreneurship education courses. Adapting Bandura’s concept to measure perceived creative confidence therefore seems like a worthwhile addition to the assessment of the effectiveness of entrepreneurship courses.

2.8. Informed Intuition

Expert designers often describe that their decision making process tends to be heavily influences by their intuition, which they have built up over the course of many prior projects (Rodriguez & Jacoby, 2007; Suri, 2008; Suri & Hendrix, 2010). This does not mean that this is sole way of making decisions, without taking other factual information into account. It rather means, that designers use their informed intuition as an additional filter through which collected factual evidence can be evaluated and transformed into new offerings (Suri, 2008). Several authors have stated that these intuitive capabilities can be developed, even if a person is currently rooted in more analytic or “rational” disciplines such as business management or engineering (Jobst et al., 2012; Kelley & Kelley, 2013; Suri & Hendrix, 2010).

Developing an informed intuition, often referred to expert performance in the entrepreneurship domain, in takes both time and deliberate effort (Ericsson & Charness, 1994; Krueger, 2007, 2009). Entrepreneurship curricula should allow for ample opportunities to individually and collectively reflect different strategies. The ongoing discussion on informed intuition in the design field would suggest that not every argument in the design process can be backed up with facts and figures right away. Sometimes “softer” “designerly ways of knowing” (Cross, 1982, 2004) are equally important to breakthrough ideas.

2.9. Studio-Learning

Designers often practice their craft in a design studio, where different sources of inspiration, artefacts from older projects and reminders of current projects are taking over large parts of the available space. A studio setup allows for deep immersion during the problem-solving approach, self-guided learning and high levels of collaborative engagement (Welsh & Dehler, 2012). Similar effects can be observed when studio-like environments are provided for educational settings (Welsh & Dehler, 2012). In their book *Make Space*, Doorley and Witthoft (2012) provide a comprehensive guide of how learning environments can be tailored into studio-like learning experiences. Both authors attribute much of the current success of the Stanford d.school, one of the forerunners in interdisciplinary Design Thinking education, to how the learning environment was carefully crafted to provide a studio-like learning environment based on the student's actual needs.

Working in a studio environment fosters a productive team atmosphere (Zárraga & Bonache, 2005). It better enables learners to contest each other's ideas and create a learning environment where critical comments during the design process are welcome and not stigmatized (Welsh & Dehler, 2012). A studio environment also provides a natural conversation space for the involved learners. By reflecting their experiences as a group, teams can take ownership of their learning and further increase its effect (Kayes et al., 2005). Stempfle and Badke-Schaub (2002) have found that successful design teams spend about 1/3 of their time jointly reflecting and refining their methods. In their study of novice and experienced multidisciplinary product development teams, Seidel and Fixson (2013) have discovered that increased team reflexivity is positively associated with better performance during concept generation activities, but negatively associated with performance during concept selection activities.

This discussion in Design Thinking shows many parallels to the literature on experiential learning in entrepreneurship education (Krueger, 2007, 2009; Löbler, 2006). So far however, the physical environment in which experiential learning is taking place, has only received limited attention.

3. EXAMPLE: THE ACADEMIC PROGRAM FOR ENTREPRENEURSHIP (APE)

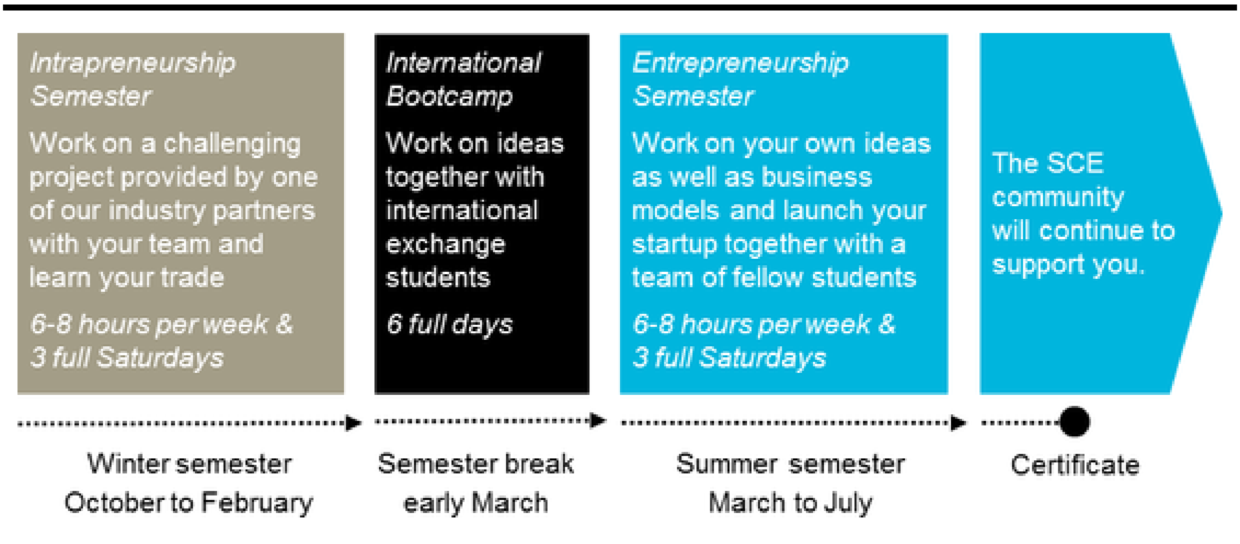
With more than 18,000 students, the Munich University of Applied Sciences (MUAS) is the second largest University of Applied Sciences in Germany. Its strategy builds on three guiding principles – entrepreneurship, internationalization and sustainability. Its Strascheg Center for Entrepreneurship (SCE) acts as a hub for entrepreneurship activities within the university and the larger entrepreneurship eco-system. With around 30 staff members, the SCE runs a new venture consulting programme and a startup incubator. Through unique entrepreneurship education formats it reaches up to 1,000 MUAS students per year across all 14 schools (Turgut-Dao et al., 2015). In 2011, the SCE and MUAS were jointly honoured as one of the first EXIST-entrepreneurial universities by the German Federal Ministry of Economics and Energy.

The Academic Program for Entrepreneurship (APE) is the SCE's flagship entrepreneurship education programme. As one of the first formats of its kind, its curriculum heavily builds on principles from Design Thinking to form a challenging 10-month extra-curricular programme. More than 30% of its graduates start a successful startup within five years of graduation. In 2015, the two startups Freeletics and ProGlove, which were both co-founded by programme alumni, were among the top 25 startups in Germany, according to Horizont (2015).

Each year around 30 qualified participants are accepted. All applications are filtered for highly motivated T-shaped individuals who are able to strive in multidisciplinary settings. The application process is open to students and young professionals from all local universities across all disciplines.

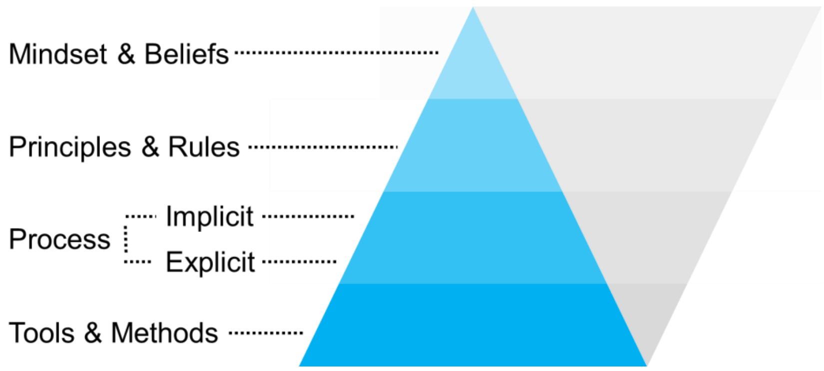
The APE curriculum is designed to prepare graduates for careers as startup entrepreneurs or corporate intrapreneurs (see Figure 3). Over the course of 10 month, participants are working on three separate projects. This setup allows them to experience different industries, team settings as well as multiple “wins”, i.e. successfully completed projects. For the first project, paying industry sponsors such as MAN, Allianz and Steelcase are recruited to provide wicked problems to solve in their industry. Participants are given access to different company representatives and facilities, which allows them to quickly immerse themselves into their projects. Resulting Intellectual Property, products and services are owned by the industry sponsor, who may choose to implement these results together with students from the programme (e.g. during paid internships or part-time employment). The second and third projects during the APE, focus on wicked problems identified by the participants. During all projects, participants are mentored by experienced coaches from academia and industry. Content is mainly provided via a flipped classroom approach. In-class lectures were replaced with short reflective workshops in which each team shares what they have learned during the previous week. This includes success stories, stories of failures, necessary iterations, reflective thoughts on available tools and methods as well as how team conflict is being handled.

Figure 3: APE Curriculum



Within the APE the pedagogical pyramid, shown in Figure 4, is followed bottom to top. Focussing on concrete tools and methods first and on mindset and beliefs later, seems counter-intuitive, in our experience we found this to be the most effective teaching strategy. The tools and methods from the “designer’s toolkit” (IDEO, 2016) help the students to move towards action rather than contemplation. Students start solving their wicked problems right away. In applying these new tools and methods, students learn about the benefits of their multidisciplinary team settings and start developing their creative confidence. During the APE, different explicit design process models, such as the Double Diamond model shown in Figure 1, are introduced. Students use these models to structure their projects and to reflect on when each of the tools and methods should be used. A formalized design process model allows the student teams to immerse themselves in tasks at hand without losing focus of the bigger picture. With experience, students will start to “make these processes their own” and adapt the formalized models into individual implicit problem-solving approaches. Through individual and collective reflective exercises, principles and rules, such as when and how to iterate as well as the dynamics of divergent and convergent thinking, start to emerge. As the students are experiencing these principles and rules live during their projects, they are better able to grasp these abstract concepts. Towards the end of the programme, they have become intuitive problem-solvers. An entrepreneurial mindset and positive beliefs about entrepreneurship have emerged. Once students reach this stage, they realize that this mindset and their beliefs are the most powerful learning they can take away from the programme. At this point the pyramid is turned upside-down.

Figure 4: APE Pedagogical Pyramid



The APE acknowledges the importance of the physical learning environment during this journey. The studio learning environment (see Figure 5) allows the students to move away from a traditional classroom setting and truly immerse themselves in their projects. All furniture is movable and allows students to customize their environment according to their current needs. Light-weight foam core boards are used to capture information on sticky notes, photos and visual diagrams. These boards can be easily moved and stored in-between classes. Different prototyping materials are provided to allow the students to test their assumptions about ideas and concepts on the spot.

Figure 5: Studio-Learning in the Steelcase Creative Hall

4. CONCLUSION

Current discussions in the field of Design Thinking show many parallels to the ongoing debate about how entrepreneurship education should be approached. In our experience, Design Thinking offers a powerful and accessible way to facilitate multidisciplinary projects. It provides entrepreneurship educators with a number of important concepts, tools and methods that may be directly integrated into existing courses. Design Thinking is an engaging way for students to learn about customer development, problem-solving, product-solution fit, creativity, divergent and convergent modes of thinking, iteration, failure, resilience and teamwork. It allows students to develop their creative confidence and shift their beliefs about entrepreneurship. We therefore think that adding principles from Design Thinking to entrepreneurship is a worthwhile endeavour.

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