

# **DOES DESIGN THINKING MEDIATE CRITICAL INNOVATION SKILLS? AN INTERVIEW APPROACH TO SYNTHESIZE FIVE COMPETENCIES TAUGHT AT THE D.SCHOOL**

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## **ABSTRACT**

Through interviews with seventeen teachers of the schools of design thinking (d.schools) in Potsdam and Stanford about their curriculum, we were able to propose five basic skills that are helpful in forming an innovative person. These skills are based on the reoccurring statements of d.school teachers. We are convinced that they are essential for problem solving and for the development of innovations. These skills are open mindedness, empathy, T-shaping, dealing with ambiguity, and creative confidence. The process is driven through in-group cohesion and moderated through between-group competitions. The findings are summarised in a model.

*Keywords: Design thinking, critical innovation skills, creative confidence, empathy, dealing with ambiguity, open mindedness, T-shaping, motivation.*

## **1 INTRODUCTION**

Innovations are largely discussed as being a crucial driver for success. Innovations are not only judged by their technical and economical success, but also by their contribution towards sustainability and how they contribute to social progress. In the last few years, faced with growing problems like distributive justice and pollution, the general public has recognized that innovations should also be liable to these criterions. However, the question remains which educational programme fits best when teaching students to generate the innovations that are needed to focus on social, human and sustainable aspects, which are supplementary to viability and technical feasibility. To overcome this gap, the schools of design thinking (d.school) in Stanford (USA) and Potsdam (Germany) are trying to educate future innovators. At the d.school, students learn the design thinking process in a project based, next to their regular studies, twice a week. Within the curriculum, the students learn methods with regards to process, knowledge, and gaining team competencies and are thus prepared to face challenges.

The d.school is experienced in conducting projects, which are provided by partners from the economy, administration, non-governmental organizations (NGOs) or research departments. The project partners ask student teams to generate innovative ideas for their needs. At the d.school, learning is project-based and students are not taught in a classical sense. A d.school teacher acts more like a coach and supplies the students a toolkit for problem solving. The goal of d.school is to form an innovative person that is able to find his or her own pathway to a solution which also addresses social and sustainable aspects. In the following, we call these ‘critical innovation skills’.

In this paper, we attempt to answer the following questions:

- ‘Why does an international company as design thinking students to solve its problems?’
- ‘Which skills are taught to the students by the teacher of the d.school?’

We dedicate our research to finding the key drivers for innovative ideas and their potential moderators. We interviewed d.school teachers about their observations and insights concerning the innovations at the d.school. This is a first approach to fill in the black box between education and future innovators.

### **1.1 Critical Innovation skills**

In the early twentieth century, the definition of innovation was mainly focused on the technical progressions [1]. Nowadays however, this definition would not be sufficient considering the increasing social and sustainable aspects that make a holistic approach necessary. Thus, we see innovation as a

construct that builds on scientific knowledge and serves as the basis for the invention of new products and services and is thus necessary to acquire an advantage in today's competitive market [2]. In the last decade, especially it has become obvious that the public concern regarding environmental issues has increased, thus offering a broad field for new sustainable innovations. However, NGOs are not the only ones who hire design thinking schools for these reasons. Companies also rely on design thinking schools, because consumers appreciate it if products have an ecological image [3]. Due to the limited space in this paper, we are not focusing on the details of the curriculum, but are supposing that design thinking education is able to mediate innovation skills.

## 1.2 Is our approach scientific?

The classical scientific approach consists of falsification instead of verification (which is seen as impossible to prove) and a deductive method seems preferable to an inductive method [4]. However, this philosophical assumption has also caused disagreement [5], because it is limited to probabilistic measurements. In our study, we did not have any specific hypothesis about the single predictors that we expected to find. Nevertheless, there is a need to investigate our theoretical assumptions statistically in the future.

## 2 METHODS

The format of each session was an informal one-to-one meeting. The interviewees were randomly selected from the current teaching staff and brought together in summer 2010. Parts of these meetings have been used for further investigations [6]. The participants consisted of teaching personnel from the d.school in Stanford (USA) and the d.school in Potsdam (Germany). Our data collection process included 8 semi-structured interviews with design thinking teachers (3 female and 5 male) in Potsdam and 9 semi-structured interviews with design thinking teachers (1 female and 8 male) in Stanford. The average duration of an interview was 45 minutes, but some also lasted between from 26 minutes to 90 minutes, depending on the teacher's level of participation. The interviews were begun audio-taped and started by asking the experts about their background, their involvement in the d.school, their level of expertise and their goals in design thinking education. This was in order to find an objective and reliable questionnaire on the one hand, but also to leave enough space for individual notes on the other. We implemented the following structure:

- Goals of design thinking education with regards to *cognitive knowledge transfer*. This refers to the knowledge that is explicitly taught during classes.
- Goals of design thinking education regarding the *emotional and motivational abilities* students should develop.
- Goals of design thinking education with regards to the *competencies and skills* students should learn.
- We also defined one *open category* in which the interviewees had the chance to express other goals, which they felt were different or did not fit into the given categories.
- In the last category, they were asked to identify *changes in behaviour* as well as learning effects, which were not intended but were observed in students while they undertook the design thinking education.

### 2.1 Data Analysis Method

We used a qualitative approach, attempting to find emergent patterns and reoccurring statements. After the identification of items, key categories were created grouping similar items together [7]. In addition, the findings were written down in memos that covered the key insights of the researcher while still referring to the original sources. We focused on the dominant patterns of data, considering plausible and revival explanations as a technique for building explanations. This led to the categorization of data, which helped in identifying the key points as a hypothesis of causation.

## 3 RESULTS

Through our approach, we were able to synthesise the five skills most often mentioned skills and how they are taught within d.school. These skills are: minded openness, human centeredness, T-shaping, empathy and creative confidence. In order to clarify these points, the following section provides an overview of how these skills are defined in literature and is supplemented by quotations from the

d.school teachers. Afterwards, variables that might moderate the effects of these skills are considered. The paper compiles the results into a model.

### **3.1 Skills**

#### **3.1.1 Open mindedness**

We considered open mindedness as a trait that is accessed in personality questionnaires as e.g. the NEO-PI-R by Costa and McCrae [8]. Thus, this personality trait is summarized by the following: an interest in art, in being adventurous, in coming up with new ideas and in regarding the world with curiosity. A teacher's quote makes it clearer; Students are taught to overcome *"one way thinking"* while they become *"more and more open-minded and tolerant towards ideas, challenges and users"*. Another teacher expressed it like this: *'They learn open mindedness towards the other thoughts of another person and other disciplines'*. There are several guidelines in the d.school which are repeated as catch phrases and internalized as mindsets e.g. *'encourage wild ideas'*, *'defer judgement'* and *'one conversation at a time'*. These rules are internalized as mindsets [9] via experiencing techniques and methods, for example brainstorming or dark horse. Dark horse is a method with the aim of prototyping the craziest idea, concept or radical use of material.

#### **3.1.2 T-shaping**

One can understand the term "T-Shape" literally, because this skill uses this letter as a metaphor; the vertical bar should symbolize one's own discipline and therefore the expert knowledge. The vertical bar on the other hand describes one's ability to connect with others and use the other's expert knowledge as well. Guest [10] describes the T-shaped person as follows: *'This type of rounded personality is also sought in other branches of the same theory, which prizes individuals known as T-shaped People. These are a variation on Renaissance Man, equally comfortable with information systems, modern management techniques and the 12-tone scale'*.

A d.school teacher should stress the importance of the development of T-shaped skills by the students and train the skill using various methods. Most of the d.school students are advanced in their studies and some have already completed a degree, or a similar qualification, at University. Thus, they have a focused discipline, specific knowledge and specific working methods. Therefore, the skill is also essential within an inter-disciplinary team in order to enable access to expert knowledge and to deal with insights together. Students learn how to jump quickly into a new problem field and thus generate often surprising first hand insights and new knowledge.

#### **3.1.3 Empathy**

Empathy allows us to understand how someone else is feeling, or to make hypotheses about their thoughts. Through empathy, we are able to understand the intentions of others and predict their behaviour, "[i]n short, empathy allows us to interact effectively in the social world. It is also the "glue" of the social world, drawing us to help others and stopping us from hurting others (Baron-Cohen & Wheelwright, p. 163) [11]. This general definition has to be narrowed to provide a useful tool for understanding the importance of empathy during the design thinking processes. In the last decade, it has become widely accepted that customers' ratings are not sufficient, but empathy is also a necessary quality for developing products or services to realize clients' needs. The teachers' statements' went in the same vein: We often heard the term *'human-centeredness'* as a construct highly similar to empathy. Thus, the student should consider *'focusing on human values'* in every step of the process. To conclude, we quote a teacher talking about his students who says that they *'develop a friendly curiosity towards the strangeness of the other'*. However, to be able to perceive this human need, students have to be able to understand the needs of a person who might also be dissimilar to themselves like e.g. within a project focusing on handicapped people. Therefore the design thinking education delivers special techniques and methods to train the human-centred perspective via methods like *'shadowing'*. This involves students following one of the potential users through a full day in their everyday life for example in their work place environment. Via this method, students take the role of the user in a specific context for example, as a nurse in an emergency department of a hospital.

#### **3.1.4 Dealing with ambiguity**

The term *'ambiguity'* is used, in sociology and social psychology to indicate situations that involve uncertainty or to help in merging two or more contra dictionary facts into one statement. We state the

hypothesis that the students were taking advantage of the multidisciplinary team constellation and their colleagues' backgrounds, and specialized knowledge. Furthermore, they are trained within a creative space using, processes, tools, methods and techniques to solve problems that unify different stakeholder perspectives. Roger Martin (p. 41) writes about integrative thinking "as to hold two opposing ideas in their minds at once" and defines an integrative thinker as follows: "[...] they don't mind the mess. In fact, they welcome it, because the mess assures them that they haven't edited out features necessary to the contemplation of the problem as a whole. They welcome complexity because they know the best answers arise from complexity" [12]. We think that this describes well what we mean with by the skill „dealing with ambiguity“:

### **3.1.5 Creative confidence**

The term creative confidence was first used by the d.school founder David Kelley [13]. Kelley used creative confidence in a way that is nearly comparable with the construct of creative self-efficacy as defined by psychologists [14]. Creative self-efficacy describes the belief in one's own self-efficacy by resolving problems using through one's own creative behaviour. According to Amabile, [15] creative confidence is also critical for finding creative outcomes within organizational and educational contexts and could be supported by the supervisor and the work climate. Thus one of the Design thinking education goals is to establish creative confidence as a crucial driver for innovation. The students learn by the repetition of the design thinking process and they also learn how to act and handle a given challenge, which often contains wicked problems [16]. The fact that students are successful in solving problems and develop innovative outcomes leads to a confidence in one's own creativity and competence. Students are often fascinated when they experience their own creative efficacy. One teacher said '*they are surprised about their own creativity*' and another teacher has the ritual of asking the students at the beginning of the educational process: '*Who is creative?*' and only a few students with artistic or design backgrounds give a positive answer. However, at the end of the educational process, they all shout: '*I am!*'

## **3.2 Moderator variables**

Next to of the five skills that are gained, we have defined two variables that moderate the process of becoming an innovative person. These variables are the selection process and group effects.

### **3.2.1 Selection procedure**

Based on the findings of organizational psychology, we think that high barriers during the selection procedure increase the members' willingness to identify themselves with the norms and values of the organization, and they are then willing to put more effort into their work [17]. One could raise the commitment by increasing the investment, e.g. a difficult selection procedures that requires an applicant to earn his or her acceptance. The applicant is also more committed if he or she makes their membership to an organization public [18]. At d.school in Potsdam, there are approximately four times more applicants than places available and during the application procedure, motivational letters and a homework assignment are handed out. After passing this first barrier, you also have to pass a two day so-called "d.camp", which is similar to an assessment centre. Here again, research has shown that the adequacy of the selection was judged higher after applicants had participated in an assessment centre than after situational interviews and beliefs about adequacy in turn predict organizational commitment [19].

### **3.2.2 Group effects**

It might seem questionable that the principles of classical group theories [20] would work within d.school for at least two reasons. Firstly, it might be possible that the students do not recognize themselves as a group member of the d.school, but more as a project group member. Secondly, the groups are changing throughout the course with every new project, which might be in the conscience of the students meaning that they will not commit themselves to a time-constrained group. However, the actual identification with one group also depends on the positive or negative status of this group [21]. Thus, it might be reasonable to suggest that there is a higher probability that a student would identify him or herself with the project group if he or she perceives the other group members as beneficial in producing a positive outcome, e.g. a successful presentation. Behavior emerges from two contexts; from long-standing intimate relationships and from normative behavioral structures of the

social environment or community [22]. Thus, we assume that if there is an initial high motivation for single group members these values are adopted by the other members and through the changing groups spreads throughout the whole d.school course. When objective (e.g. physical) judgements about an output are not available, relative comparisons (e.g. social layer) are used. The feedback from social comparisons serves also as information about how to increase the own performance [23]. Considering that d.school students work in teams, group dynamic effects might also play an important role for their motivation to increase their performance, mainly since an individual's activity is not available anymore. If an individual identifies oneself with a group, the motivation exists to keep positive knowledge about the in-group [24]. If a member of a group values the membership of the group, the tendency arises to also value the products of their own group more than other (control) groups would do [25]. However, the group effects might also have negative effects for the individual. In their imagination what the future self could look like, people have no limitations, except that they cannot avoid making comparisons with outstanding role-models [26]. Therefore, the inter-group competition might also have negative effects on single skills such as creative confidence, e.g. if one is often confronted with the highly successful project presentation of other groups that highlight his or her own limitations.

## 4 DISCUSSION

In this paper, we have presented five skills which are taught to d.school students and are essential for new innovations. It is difficult to judge if these skills are fundamentally different from those in consultancy firms, but from the reports of the d.school teachers, it seems as if the innovation process is reinforced by motivation, which in turn results from ignition processes and in-group and between-group competition. An additional benefit might be that d.school students have no or have very little experience in working in a consultancy firm and are therefore not affected with their points of view. The advantage in approaching challenges from a new perspective becomes clearer if one considers that a d.school group consists of interdisciplinary students, which also might be beneficial in finding new solutions. In this work, we have attempted to identify the single components that are taught to students and our results can be summarized in the following model.

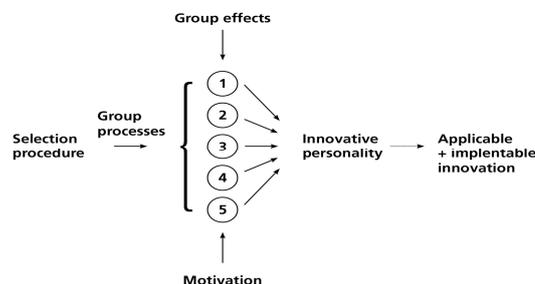


Figure 1. The 5-Skill model

The five skills are: open mindedness (1), T-shaping (2), empathy (3), dealing with ambiguity (4), creative confidence (5) are the five innovation skills which are mediated by the d.school. The first moderating factor is the selection that could be seen as 'a trigger' in increasing the motivation of the students. The second one is group effects, mainly intergroup competition that generates a climate where one is continuously motivated to increase their own or their group's performance, respectively.

### 4.1 Limitations

The five-skill model arose from the re-analysis of interviews with d.school teachers from Potsdam and Stanford. Thus, it is only a theoretical construct that needs further confirmation. It might e.g. be possible that a factor-analysis would show that open-mindedness and dealing with ambiguity are the same factor. Obviously, further research is required. Additionally, the d.school has a maximal duration of one year. Are teachers capable of becoming acquainted with the students from the beginning in order to improve their skills or are they simply generalizing because of stereotypes and/or expectations? It should also be mentioned that an objective measurement of the results is nearly impossible; Because of copyright issues, some of the project partners prefer not to publish the implementations or ideas respectively, in order to enhance them further within their company.

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