

Design Thinking Mindset: Developing Creative Confidence

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While knowledge of design thinking (DT) processes and familiarity with its tools can be achieved relatively quickly, few educational programs foster a DT mindset. This study examines the effect of an experiential DT learning environment on the development of a DT mindset. We analyse the extent to which key attributes of a DT mindset are understood, evaluated and assessed. We show that the general value and related challenges of learning a DT mindset are well understood. However, students perceive the importance and value of particular mindset attributes differently; in particular, postgraduate student reflections provide a nuanced and interlinked view of different mindset attributes. We provide a framework for learning objectives and exemplary activities to teach and encourage designerly ways of thinking and doing in business education. We argue that a mindset that embodies DT can address deficits in business school education, better preparing students for future work.

Keywords: Design Thinking, Mindset, MBA, Creative Confidence, Education

Introduction

To help managers develop innovation capability, many business schools have started including design thinking (DT) in their curriculum (Garbuio, Dong, Lin, Tschang, & Lovallo, 2018). The Financial Times describes DT as ‘the skill that every MBA student needs’ (Stigliani 2017). However, to realise the full benefit of innovation initiatives, educational DT programs have to do more than convey knowledge about DT and its tools; they must also develop creative confidence (Kelley & Kelley, 2013) and foster an innovation mindset. Hence, we wonder how business schools can teach DT to encourage designerly ways of thinking and doing.

DT is as much a mindset as it is a process and set of tools. Both aspects have important implications for the improvement and innovation of businesses. As a process and set of tools, DT informs and shapes practices of dealing with complexity and solving issues. Applying the iterative stages of a typical DT process includes deep empathy with end users, reframing of the problem area, ideation, prototyping and testing. As a mindset, DT refers to the underlying values, cognition and resulting behaviours that, over time, find their way into the beliefs of people and culture of organisations. While individuals and whole organisations can adopt the processes and tools of DT and learn new innovation practices over time, it is the mindset that helps innovation objectives to be achieved at a deeper and more sustainable level.



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Micheli et al. (2018) identify key processes, methods and tools of DT. While not explicitly distinguishing these from the cognitive and behavioural attributes of DT, they raise a number of research questions for further study, including ‘what constitutes a design thinker and what kind of training and practice is needed to become one?’, ‘what is the relationship of DT with organizational culture?’, ‘how can the acquisition and effectiveness of design thinking skills be assessed?’ and ‘what are the results of introducing design thinking in MBA curricula?’ This study explores these research areas through analysis of an experiential learning program that employed instructional methodologies and activities to facilitate the learning of DT.

We explore the value of DT for postgraduate business education—that is, we explore whether and how participation in a DT curriculum affects a student’s ability to innovate, and whether a DT mindset can be taught and practised via experiential learning.

Literature Review

Design Thinking as a Mindset

Innovation literature has placed increasing importance on design as an integral capability for innovation and adaptation (Dodgson, Gann, & Salter, 2005). Organisations are trying to integrate the design approach to solve complex social problems and issues of organisational management, and to explore greater synergies between business strategies and product and service innovation (Martin, 2011; Sobel & Groeger, 2013). Design is no longer viewed as a problem-solving activity; rather, it is viewed as a knowledge generation and integration activity (Hatchuel, 2001). The starting point for many scholars looking at design (thinking) within management and organisation studies has been Simon’s (1969) assertion that design is an activity undertaken by many professionals.

In recent years, management scholars have recognised and reconceptualised the role of design and DT in business, generating a new sub-field (Carlgren, Rauth, & Elmquist, 2016; Gruber, De Leon, George, & Thompson, 2015; Hobday, Boddington, & Grantham, 2012; Weick, 2004) based on the fact that many organisations achieved positive results using DT (Bevan, Robert, Bate, Maher, & Wells, 2007; Body, 2008; Chang, Kim, & Joo, 2013; Lafley & Charan, 2010; Leavy, 2012; Meyer, 2011). Much of this research has focused on describing DT by means of phases and modes that illustrate the various activities that a team is engaged in. However, these activities are guided by a set of principles or mindsets that recur in many of these modes.

An emerging research stream explores the ‘design state of mind’ (Beverland, Gemser, & Karpen, 2017; Carlgren et al., 2016). This stream has started to conceptualise the enactment—or the *thinking* and *doing*—of DT on the individual and team level. The underlying assumption is that a DT mindset has a positive influence on individual, team and organisational culture and, ultimately, innovation performance. (Liedtka, 2011) builds on the fixed and growth mindset dichotomy (Dweck, 2012) to explain why some managers succeed and others struggle to innovate based on the differences in mindset. Johansson-Sköldberg et al. (2013) distinguish between the discourse of ‘designerly thinking’ rooted in the field of design research, which considers DT as a ‘practice’—that is, an integrative framework for creative and analytic modes of reasoning supported by a process and set of tools and techniques (Liedtka, 2015)—and the more nascent management discourse on DT. However, fundamental attributes of a DT mindset have been consistently noted in the literature. While definitions may vary, the views are not as inconsistent as they may seem. Various attempts have been made at assimilating knowledge about DT into a general description.

Kimbell (2011) builds on the notion that DT is a cognitive style, a general theory of design and an organisational resource. Hassi and Laakso (2011) make a similar attempt at unifying an understanding of DT, identifying it as a form of practice, thinking style and mentality. Carlgren, Elmquist and Rauth (2016) operationalise DT on three levels: principles, practices, and mindsets and techniques. Summarising 70 articles on DT, Di Russo (2016) identifies 17 commonly cited characteristics and concludes that ‘most definitions present design thinking as a mindset, method, process, attitude or a combination of all four’ (p. 259).

Schweitzer et al. (2016) identify 11 DT mindsets based on expert DT practitioner interviews: having empathy towards people’s needs and context, embracing collaboration and diversity, being inquisitive and open to new perspectives and learning, being mindful of process and thinking modes, embracing experiential intelligence,

taking action deliberately and overtly, being consciously creative, accepting uncertainty and being open to risk, modelling behaviour, having the desire and determination to make a difference, and being critically questioning. These mindsets confirm a set of commonly understood and applied attributes, and reveal organisational constraints on translating cognition into behaviour.

DT practice and research offers many descriptions of design principles, thinking modes, and creative behaviours and postures that are often subsumed under the term 'mindset'. The definition of 'mindset' varies; most authors seem to agree that, while a firm can adopt DT processes and learn new innovation practices over time, it is the DT mindset that enables innovation objectives to be achieved at a deeper and more sustainable level.

Conversely, some authors report that some companies are so fixated on process that DT is turned into a rigid plan, which is implemented like any other efficiency-based process (Nussbaum, 2011). If it is the design state of mind that enables the process and activities that successful practitioners of design thinking employ to create impact and value, more research is required to clarify the specific attributes of the DT mindset as well as the relationships between relevant factors.

Design Thinking Education

The most popular pedagogical model for teaching DT to business students involves project-based learning (Glen, Suciu, Baughn, & Anson, 2015). This is consistent with the increasing use of project and problem-based pedagogical frameworks in other professions, such as engineering, medicine and law (Dym, Agogino, Eris, Frey, & Leifer, 2005). The DT approach reflects the move away from passive teaching approaches towards more engaged and experiential problem-based learning that is taking place in tertiary education (Glen, Suciu, & Baughn, 2014). Teaching DT via experiential problem-based projects entails numerous challenges. For example, providing the experience and iterative practice needed to develop DT skills while accommodating students' desire for structure and predictability of outcomes. DT is not a rigid, predefined series of orderly steps (Brown & Katz, 2009). In practice, DT students gain benefit from going back and forth and in between as understanding of the problem space increases and solutions are refined. While some structure is necessary, DT requires a phased developmental process, enabling multiple cycles of repetitive practice.

Glen et al. (2015) report how reliance on soft skills, such as observation, empathy, intuition and non-linear processes, leave students of DT feeling that the process is more about chaos than technique. Similar concerns have been raised by businesses encountering DT for the first time. Business students, being used to a more ordered and structured learning environment, find the DT process uncomfortable and unfocused (Welsh & Dehler, 2013). Businesses, like faculty, usually focus on the process and tools of DT when starting out; that is, they tend to manage the learning experience via the phases of the DT process (problem finding, observation, sense making, ideation, prototyping and testing) while dealing with any challenges as they arise. This approach helps to alleviate frustration and confusion, provides reassurance, and emphasises how the phases and techniques work towards an outcome. However, it also limits students' opportunity to explore the various principles and mindsets of DT that help achieve innovation objectives at a deeper and more sustainable level.

In a recent study of experiential learning and entrepreneurship in education, Garbuio et al. (2018) emphasise the importance of design cognition, including the cognitive acts of framing, analogical reasoning, abductive reasoning and mental stimulation. They find that teaching thinking modes and mindsets is more effective than teaching processes and demonstrating tools, which are often not easily transferable to other domains. Hence, their study provides some initial support for our proposed emphasis and mindset. The authors recommend teaching design cognition to MBA students in a studio setting and incorporating critical reflection, with lecturers acting as coaches and practising designers supporting the teaching.

Overall, this nascent stream of literature provides valuable insights about how to create active, reflective and engaging programs by combining experiential learning with DT. However, it fails to acknowledge learners' responses to a DT mindset. How do students interpret the different attributes of a mindset? Which attributes are perceived to be relevant and valuable? How should an organisation implement a DT mindset and where should they start? Our research aims to shed light on these questions.

Research Context, Data and Analysis

Research Context

Our exploratory study was conducted on the back of a 10-week postgraduate DT course, comprising 40 hours of face-to-face class time spread across five full days and two block weekends, starting with two consecutive days, followed by field research and a second three-day block. Participants ($n = 58$) were a mix of part-time and full-time MBA students with five to 15 years of professional experience in a wide range of industries, including retail, financial services, manufacturing, pharma, public services and business functions, such as procurement, research and development, production, operations, finance, human resources, marketing and sales. None of the students were already experienced in the application of DT.

During the course, students worked in randomly allocated teams on a living case study with an external partner organisation. The course followed Liedtka and Olgivie's (Liedtka & Olgivie, 2011) process with students working through the phases of inspiration, ideation, implementation and what works. Accordingly, the course focused primarily on the DT process and corresponding tools and practices. The DT mindset was introduced on the first day—after students had already gone through their first DT experience as part of a two-hour introduction to DT, which involved an exercise called 'the commute challenge'. The course instructor followed Schweitzer et al.'s (2016) classification of 11 DT mindset attributes. However, for purposes of simplicity, the following five key attributes comprised the main focus:

1. Empathetic towards people's needs and context (EMP)
2. Collaboratively geared and embracing diversity (COL)
3. Inquisitive and open to new perspectives and learning (INQ)
4. Optimistic and modelling behaviour
5. Making things tangible.

Large posters of the symbol attached to each attribute provided a visual reminder in the classroom throughout the course, acting as a reference point or discussion stimulus when a particular attribute was relevant during an activity or project phase. In addition, Schweitzer et al.'s (2016) article was part of the required course readings.

The first three in-class sessions focused on discovery; framing and reframing of the challenge; conducting field research; synthesising data; developing insights; and defining a human-centred problem statement. All teams worked with the same broad design challenge and project partner. However, as part of the learning experience, each team was tasked with defining the scope and focus of their project. Experienced strategic designers from a leading consulting firm coached teams during one of the sessions, providing hands-on advice during analysis and synthesis.

Teams focused on ideation, prototyping and testing solutions during the last two in-class sessions. During the final in-class session, instead of presenting an ultimate solution, teams tested their solution with their project partner, receiving feedback on how they had defined the user and problem statement, and their solution prototype. Teams then had another three weeks to conduct further user research, develop and test prototypes, and run co-creation workshops with stakeholders, before submitting a final prototype and 3,500-word research report. Two weeks after completing the team project, all students submitted an individual reflective journal; these constitute the primary data source for this study.

Reflective Journal

Reflection is used in many fields, including design, architecture, product design and engineering, and is relevant to other professions as well. Drawing on Kolb's (1984) experiential learning theory and Schön's (D.A. Schön, 1983; Donald A Schön, 1987) work regarding reflective practice, we understand experiential learning as a process in which actions result in sensing new information, which stimulates insights and learning. Schön (1983) differentiates between reflection-in-action and reflection-on-action; the former is 'action present', which means reflecting on the incident while it can still benefit that situation. By contrast, the latter involves reflecting on how practices can be developed (changed) after the event.

We designed the assessment for our DT course to encourage and facilitate individual reflection-on-action; specifically, we asked students to think back on their project-based experience and to consider how various attributes of a DT mindset contributed to their project outcomes. Schön (1983, p.76) asserts that, through this 'reflective conversation with the situation', one can come to appreciate consequences and evaluate qualities that would not have been anticipated ahead of time. Consequently, we asked students to evaluate which attributes of a DT mindset were effective and to describe how they were effective. Following the experiential learning cycle of acting, reflecting and conceptualising, we then guided students to envisage future applications of a DT mindset within their own professional practice and organisational context.

The following questions were employed to stimulate student responses:

- Choose two mindset attributes that you believe are most relevant for your organisational context and discuss the behavioural manifestations (i.e., actual doing) of each based on your own experience as part of the design challenge. Be specific and reflect on how you engaged in certain behaviours that represent each mindset component; explain advantages, possible outcomes as well as challenges and pitfalls of each behaviour across the design thinking process.
- Pick one of the two described mindset attributes and justify how and why embracing and fostering such a mindset could be beneficial to your organisation. Discuss the how and why in the context of a very specific starting point (e.g., a particular department, team or process).

Analysis

Thematic analysis (Boyatzis, 1998) was carried out using the software Nvivo 11. Thematic analysis may be based on prior categories or on categories that become clear to the researcher as the analysis proceeds. The five attributes of a DT mindset represented our a priori themes; further codes were added as they emerged from the data, which was closely inspected for recurrent themes, topics and/or relationships. Following an objective research strategy (Marshall & Rossman, 2014), additional starting points for analysis were understanding individual challenges that may arise while practising an attribute of a DT mindset and suggested avenues for implementation.

Findings and Discussion

We review each DT mindset attribute and answer specific research questions before discussing this study's overarching research question: how does participation in a DT curriculum affect a student's ability to innovate, and can a DT mindset be taught and practised via experiential learning? For the purpose of this article, we present the findings for three mindset attributes only. The examples of student reflections that we provide below are indicative of the total dataset and underscore the general nature of our findings.

Empathy Towards People's Needs and Context (EMP)

Value: Identifying People First, Then Understanding Their Needs

Gaining deep customer empathy—that is, putting people at the centre of the innovation challenge—was the single most valued mindset attribute in this study. Interestingly, the reasons why students chose this attribute varied greatly, indicating that while EMP is viewed as a foundational element of human-centred design, it is seen as having various benefits, challenges and practical implications. Kelley and Kelley (2013, p.85) define empathy as 'the ability to see and experience through another person's eyes, to recognize why people do what they do'. While this interpersonal aspect of DT (Howard, 2015) is understood to be extremely valuable during the research phase, many students saw its value at a much more fundamental level. They explained that being empathetic (or occupying an empathy mindset) forced the project team to focus on external customers and stakeholders rather than internal stakeholders. This was viewed as valuable in itself, and as leading to enhanced business outcomes in the long-term. Without being prompted, the majority of students juxtaposed a DT approach with current practice within their organisation to expose the value of a DT approach. The following excerpt is exemplary:

We are public servants, and we have a fiduciary responsibility to the citizens of NSW to ensure what we do benefits them; not ourselves. All too often, senior managers create policies for the sake of promotion or cost savings, not to fix problems that citizens face.

This respondent felt that a change in perspective would ultimately lead to ‘addressing real world problems that citizens face; not our internally driven political issues’. A manager working for a large corporation involved in innovation projects explained that his team took inputs from senior leadership and did not consider the needs of the actual day-to-day users. In such circumstances, occupying an EMP mindset not only goes beyond the practicalities of working closely together with customers, users and stakeholders through the application of ethnographic methods, but also shifts the focus and subsequent activities, resources and budgets to those relevant (future) customers and users. Notably, understanding customer needs and focusing on selected target segments are common principles taught in numerous core MBA units, which all students in this study had completed prior to taking the DT elective.

One might assume that basic marketing principles, such as ‘focus on your customers’, are well understood and applied in the corporate context. Yet, our results suggest that the personal experience of focusing on empathy while conducting field work, followed by reflection and evaluation of a related DT mindset attribute, leads to enhanced critical understanding of the value that a human-centred approach can bring to business and business innovation. Therefore, the value that an EMP mindset provides may not come from an intensified human-centred approach alone, but from refocusing activities on relevant external customers. The value of EMP may be less about gaining a deep understanding of users and their needs and more about understanding who to focus on in the first place.

Value: Empathy for Team Members

Unexpectedly, a small number of students viewed EMP as a necessary condition for effective team work, stating that it was not sufficient to be ‘empathetic towards our customers’ alone, and that it was necessary to be empathetic “also to our peers”. This is interesting in the context of this study, as being *collaboratively geared* (COL) was presented as a separate key attribute of a DT mindset, yet students felt that these two mindset attributes were irrevocably connected.

In reflecting on the EMP mindset, students identified a number of challenges that can be categorised under two broad themes: solution mode fallacy and letting go of preconceived assumptions.

Challenge: Solution Mode Fallacy

Differences between the problem and solution space, as well as associated DT processes, tools and activities, were discussed with students during multiple short lectures. At the beginning of an activity that focused on problem space exploration, instructions were given (e.g., sharing field research data and focusing on capturing problems and opportunities) and students were cautioned against jumping into ‘solution mode’. Yet, many experienced great difficulties staying within an empathetic ‘problem space’ mindset and could not resist thinking about and discussing possibilities. Based on previous experience, tools—such as the ‘idea parking lot’—were introduced to capture solutions as they emerged without diverting attention away from understanding the problem space. The following statement encapsulates the conflict that many DT novices experience:

Being a senior director at a bank and having a day-to-day environment where we solve problems instinctively it took great personal discipline for me not to jump into solution mode. This ranged from the early steps of interviewing and in being careful not to put the solution in the question but also along the way as we identified an opportunity and developed ideas. I found myself going to an end state too often.

This statement supports the observations of an in-class instructor who reported that students appeared to feel physical pain when they were asked to stop imagining solutions and focus on exploring the problem further. This is not surprising, given the traditional focus in postgraduate management education on problem solving rather than problem definition (Glen et al., 2015).

Application: Setting up Interdisciplinary Teams

When students were asked to reflect on how they saw EMP being implemented within their professional practice and organisation, a number of views were expressed. Many students saw a causal relationship between occupying an empathetic mindset and embracing diversity, describing the latter as a necessary condition to gain deep customer empathy. For example, one student, who works at a leading medical device company, complained that, in her company, 'design teams comprise ... scientists and engineers who design products on technical merits alone'. Believing that this decade-old approach was a major barrier to implementing an empathetic mindset, she proposed changing the set-up of teams to 'include people with diverse backgrounds who ideally represent the customer segments but also represent the functional areas of selling, marketing, finance, etc.'.

Collaboratively Geared and Embracing Diversity (COL)

Unlike the EMP attribute, which focuses on designing 'for' people, the COL attribute stresses designing 'with' people. Dunne and Martin (Dunne & Martin, 2006) argue that multidisciplinary teams are required to holistically understand a problem and expand the range of ideas available. Research shows that heterogeneous groups outperform homogenous groups on tasks requiring creative problem solving and innovation (Thompson, 2003). Given the diversity of students' professional backgrounds and their random assignment to team, 'fairly' heterogeneous teams worked on the design challenge in this study.

Value: Multiple Perspectives and Higher Productivity

Based on students' reflections and informal feedback, many found themselves outside their personal comfort zones as they experienced time-pressured, fast-paced activities, and struggled with different working styles in a newly composed teams. However, upon reflection, many acknowledged the value of team diversity for establishing the necessary broad perspective to work with the challenge. The following excerpt is indicative:

Our group had both success and struggles with this concept. We were lucky to have strong team diversity in ethnic background, occupation, personality profiles, gender, geographic living location, industry and life experience. This led to much debate but also varied thinking during our ideation and synthesis phases of our assignment. The advantages by incorporating this mindset were the broad experiences we were able to tap into and ensure that each member was soaring with their strengths.

Coaches encouraged team check-in and check-out sessions and facilitated intra-team feedback aimed at increasing team members' ability to embrace each other's differences, leverage individual strengths and collaborate efficiently. Teams were advised to define roles and responsibilities and openly discuss values and goals at the beginning of the project. Each student completed a FourSight © profile, which was shared and discussed to discover both their own and others' problem-solving preferences, and to leverage each other's strengths. As one student pointed out, sharing the profile was very helpful:

Being aware when someone was playing out of their preferred mindset, e.g., an engineer was having problems with 'wastage' resulting from the prototyping phase, but we turned this mindset into a strength when it came to check the logical flow in the final solution.

Embracing a more collaborative approach increased 'team morale, trust and enthusiasm', 'which led to improved quality of work'. However, this was not evident across all teams. For example, some teams actively sought project specific directions from instructors, trying to transfer a decision to a person outside the team, as they struggled to find common ground. Some students expressed concerns about the relevance of the exercise, pointing out that a truly collaborative, team-centred approach to executing a project was not relevant in their professional life, as there is 'always a manager who makes the final decision'.

Pioneering companies such as Patagonia and Zappos have long since embarked on a journey towards lean, self-managed organisational structures (Groeger, Bruce, & Rolfe, 2019; Laloux, 2014). Others have recently started using DT to become more agile, in the process highlighting the interdisciplinary and collaborative nature of the

method. However, student's comments in this study suggest that there is a major gap between understanding the importance of collaboration and acting upon it. Our results suggest that this attribute of a DT mindset requires substantial efforts to ultimately change behaviours. It appears that some students viewed this attribute as a kind of 'necessary evil' that was part of the project, but something they would happily forego once they returned to the classical hierarchical structure of their workplace.

Challenge: Poor Match and Big Egos

A number of students explained that team members were generally motivated to work collaboratively, but incompatible views on what collaboration meant and how it should be implemented resulted in conflict. The following reflection describes two opposing views:

For me, it was about bunkering down in a room, walking through the possible scenarios, building on each other's ideas, and really stress test those ideas against customer needs. Another member felt that this was not a necessary step. They felt that all work could be done independently, with video conferencing to check in at certain stages.

Another student, who referred to a similar situation in which multiple team members 'wanted to break away to work autonomously without team delegation or support', concluded that collaboration could not succeed unless teams shared the same view of what collaboration meant. For another student, being 'unable to shift our mindset from "I" to "we"' posed a major problem for the team: 'everyone was trying to prove themselves by pitching big ideas rather than collectively thinking together.' While such experiences were frustrating for students, they were also instructive, as they exemplify the problems faced by corporate innovation teams. According to Tuckman's (1965) group forming model, this can be interpreted as the 'storming phase'. When, over time, a team overcomes this conflict, it moves into the performing and adjourning stages (Tuckman & Jensen, 1977). As such, blaming a negative collaboration experience on differences in working style misses the point that team conflict is a common and necessary phase that most teams go through. Overall, people struggle to realise that, in solving complexity, no one person is responsible for the final outcome. Given that some authors place collaboration at the centre of DT (Seidel & Fixson, 2013), and that novice learners in this study did not fully embrace this attribute, we conclude that a successful DT journey could be doomed if teams are not provided with sufficient learning and reflection opportunities in relation to collaboration and embracing diversity.

Inquisitive and Open to New Perspectives and Learning (INQ)

Curiosity and an appetite for learning are central to DT (Adams, Daly, Mann, & Dall'Alba, 2011; Kelley & Kelley, 2013). This includes learning about others, challenging existing frames of thinking and seeking out new contexts in which to learn (Cooper, Junginger, & Lockwood, 2009; Jenkins, 2010; Michlewski, 2008). Students saw value in how this mindset attribute helps to overcome cognitive biases but found it difficult to balance the pressure to deliver with the desire to understand and learn more.

Value: Overcoming Assumptions and Biases

Students experienced iteration as part of the DT process, yet many resisted engaging in multiple rounds of field research. This came as no surprise, as many relied upon their established practice of applying historical data-driven approaches to decision-making (Liedtka & Ogilvie, 2012). Repeated hypothesis generation and testing was a new experience for many participants. After an initial period of resistance, many came to appreciate the iterative nature of DT. Students saw how continued inquisitiveness challenged seemingly fact-based assumptions and either proved them wrong or provided validation. The students' reflections about INQ also referred to their evaluation of gaining empathy and the challenge of overcoming their own biases. To this end, some students saw great value and a strong and reinforcing relationship between their growing empathy for others and their openness to learn. This is in line with Liedtka (2014) who suggests that overcoming individual cognitive biases drives DT innovation outcomes. One student, who works in a creative advertising agency, commented that her creative department 'desperately' needed to embrace an INQ mindset:

The creative employees bring their egos to [the] office and assume that they know the consumer, and are designing ad campaigns on the basis of their assumptions and biases. It's surprising how our very own 'ideators' work without actually understanding the customer's needs.

She identified inquisitiveness and the drive for continuous learning as the foundation upon which DT and, ultimately, innovative solutions are built. This confirms Baeck's (2011) view that DT requires a strong desire to dig deeper and a curiosity to develop actionable insights that are beyond superficial observations.

Challenge: Balancing Continuous Learning and Outcome Focus

Throughout the learning experience, students felt that they occupied an inquisitive mindset by personally conducting multiple rounds of field research. Yet, there was also frustration when the project did not move quickly enough towards a final solution. Those students then jumped into 'solution mode' instead of exploring the problem space more rigorously. One student pointed out that, despite 'a deliberate effort to keep learning along the way' and an increased level of focus during a second round of research, the team felt as if they were even more uncertain about what they were looking for. This created tension for outcome-focused students, who felt they 'were overcommitting to the learning stage and underestimating the need for time allocated to implementation. However, despite these tensions, some team members felt that they were able to occupy an ACU mindset by allowing themselves to be uncomfortable with experiencing tension and by exploring different contexts with an open mind. One downside of being inquisitive is that it can cause people to deviate and become distracted, which can be perceived as a waste of time and resources. Yet, it is precisely the cultivation of curiosity and inquisitiveness that makes collecting and analysing data in a rigorous and human-centred way possible.

Application: Inquisitive across Departments

When considering the application of a INQ mindset attribute, students thought of the challenges associated with breaking down departmental boundaries and working across silos. Hence, some saw great potential in fostering inquisitiveness about other peoples' work or other departments. An engineer described this as follows:

Due to the nature of the company every employee was focused on his own work and even though many departments are interlinked for production, the employees never intervened or shared ideas at work. There were often many times where an employee from another department had problems due to the process followed but they never discussed it with the other department to find a solution because they felt that this was out of scope of their working.

She argued that a holistic approach and culture of being open to new perspectives and learning would 'greatly benefit [her] company'. In her view, engineers with expertise and information from 'the client side' would bridge siloed thinking, creating opportunities for innovation and improvement.

Summary of Findings

Overall, we found that the majority of students in the group developed a deep understanding of different DT mindset attributes and the value that each can bring to an innovation project. Yet, those perceptions of value are much more nuanced and interconnected than the current DT literature or instructors of DT courses suggest. While some students remained confused about the nature and purpose of a DT mindset, others came to appreciate the value of occupying a DT mindset for driving tangible business outcomes in their professional practice; these students were able to transfer their experience of living through a DT project in class to their current organisational context.

Our findings are generally in line with other research on DT; however, to the best of our knowledge, this is the first study to report the reflective voice of DT student learners. Previous research on learning has primarily focused on the role of doing (experience) in fostering progress over time. We follow DiStefano et al. (2015) who argue that a key element of learning is reflection—or the intentional attempt to synthesise, abstract and articulate the lessons taught by experience. Based on our reading of student reflections, we believe that their

purposeful reflection on their accumulated DT experience led to greater learning, certainly more than any additional accumulation of experience may have achieved.

As they were ‘living’ through and experiencing the various attributes of a DT mindset, the novice learners in this study shared their personal and team-related challenges. These descriptions were rich and diverse, providing valuable insights for practitioners and educators, highlighting barriers to implementation and learning of a DT mindset. The recorded challenges varied depending on professional and cultural background, personal preferences and previous experiences. Yet, the majority of the challenges mentioned in this study mimic findings of other studies on barriers to innovation in organisational settings. This supports requests to embed DT in MBA curricula more firmly.

Our data suggest that some mindset attributes, such as COL are more difficult to adopt than others. We suspect that this is because experiential learning, by its nature, supports the development of mindset attributes like EMP. From this, we conclude that much more attention could be given to teaching DT with changing behaviours and attitudes in mind rather than by conveying processes, tools and methods alone. To focus on DT mindset learning more explicitly, we present some avenues for future research and learning design, and offer some suggestions on instructional guidance.

Towards a Framework for Learning DT

To facilitate a cognitive learning approach to DT mindset education, we recognise that a DT mindset and its attributes requires a succinct and distinctive definition. This involves assessing desirability and feasibility, as well as setting individual cognitive learning goals in the context of a DT course. Hence, in Table 2, we present three refined and exemplary definitions of DT mindset attributes based on students’ reflections, make suggestions about the objectives associated with learning about particular mindset attributes, and describe how learning can be facilitated via specific learning activities. We propose this as a starting point towards designing learning experiences for DT that focus on acquiring a DT mindset in addition to applying the process and tools of DT.

Table 2: Three exemplary DT mindset attributes, learning objectives and instructional guidance

DT Mindset Attributes (Definitions)	Exemplary Learning Objectives <i>WHAT Should Students Learn?</i>	Exemplary Learning Activities <i>HOW to Facilitate Learning?</i>
<p>Empathetic towards people’s needs and context (EMP) The extent to which a person experiences another individual’s needs and context from their perspective. The ability to place yourself, your thinking and feeling in the view of another person.</p>	<ul style="list-style-type: none"> • Apply ethnographic research method to gain user insights • Separate one’s own thoughts and assumptions from what one actually observes • Communicate problems and opportunities from a human-centred perspective 	<ul style="list-style-type: none"> • Experience user research using cultural probes (e.g., whose life is it? a day in a life, mystery shopping or immersion) • Experience active listening via interviewing and observation • Make assumptions explicit and derive hypotheses to test them • Create personas and act them out to experience another person’s perspective • Create empathy and journey maps to plot current and future user experiences • Involve users in prototyping and testing of solutions
<p>Collaboratively geared and embracing diversity (COL) The extent to which a person buys into working together towards a shared solution and is effective in the service of the team’s purpose, believing that no-one person is responsible for the final outcome.</p>	<ul style="list-style-type: none"> • Recognise the role of self and others in achieving joint outcomes (IQ vs WeQ) • Apply team formation, management and conflict resolution approaches • Appreciate team members’ diverse contributions • Create a shared vision for the team and project • Create psychological safety 	<ul style="list-style-type: none"> • Make individual behavioural preferences in team contexts explicit by discussing and reflecting on different working styles and personality traits; setting team goals and defining a common vision • Coach teams with a focus on giving everyone a voice, leaving egos behind via team check-in and check-outs, defining and sharing roles and responsibilities • Facilitate open and transparent feedback within teams; provide external individual and team feedback (coach) • Facilitate team collaboration by focusing on gaining empathy towards peers

DT Mindset Attributes (Definitions)	Exemplary Learning Objectives <i>WHAT Should Students Learn?</i>	Exemplary Learning Activities <i>HOW to Facilitate Learning?</i>
<p>Inquisitive and open to new perspectives and learning (INQ) The extent to which a person displays curiosity and a desire to learn new things.</p>	<ul style="list-style-type: none"> • Appreciate the existence and potential of unknown knowns • Question the status quo and appreciate the importance of continued learning and experimentation • Gain insights through iteration and testing of hypotheses • Create and evaluate low fidelity prototypes and small marketplace experiments • Apply system thinking to untangle complexity 	<ul style="list-style-type: none"> • Demonstrate and experience cognitive biases and practise using tools and techniques to overcome them • Identify and map knowledge, classify facts, opinions, trends and assumptions • Provide curiosity prompts, asking students to look for things that surprise them; double-down to explore the issue; share the story within team • Practice creating experiments to test assumptions and gather facts • Use triangulation to critically evaluate information • Explore the value of making learning tangible via prototypes, showing artefacts to receive feedback and not to sell a solution

Conclusion

Our research explored the extent to which key attributes of a DT mindset are understood, evaluated and assessed in terms of their practical value for individuals and organisations. We took a student-centred approach and analysed individual student reflections. Our results indicate that students have a more nuanced and interconnected understanding of different DT mindset attributes than current literature suggests.

Our results also revealed that while some students remained unclear about what constitutes a DT mindset, others felt that occupying a DT mindset could drive tangible business outcomes. Our study introduced a framework for learning a DT mindset based on cognitive psychology, providing guidance for learning objectives and exemplary activities to teach and encourage designerly ways of thinking and doing in education.

We believe that a DT mindset can address deficits in business school education, better preparing students for the future of work. We encourage future research to explore the interconnectedness of DT mindset attributes, especially how these might be quantitatively measured to determine whether an attribute that is lived in the classroom is subsequently lived in practice.

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