Diverse Approaches: Educator-centric Insights into Design Thinking Practices in Entrepreneurship Education

Purpose

Design Thinking (DT) has emerged in a variety of educational contexts within entrepreneurship and debate continues on the value of integrating DT into Entrepreneurship Education (EE). Although DT is increasingly recommended for EE practice (Baciagalupo *et al.*, 2020) there are scarce insights into how Entrepreneurship Educators apply and/or integrate DT into their practice. This study uses a constructivist paradigm of education to answer questions about the educational practice when integrating DT, with a view to understanding the schema that educators construct when encouraging learners to construct their own knowledge.

Design/methodology/approach

This study follows a qualitative, interpretive approach, drawing upon semi-structured interviews from 29 entrepreneurship educators from higher education in the UK and Europe. Thus, this study puts focus on the quality of the DT *integration* in EE - from an educator's perspective.

Findings

There exists a difference between the scholarly proposed integration of DT and the enacted practice within the classroom. Analysis identified four forms (selective, idea-centric, procedural, holistic) of DT integration in the context of EE, as well as insights into the practical barriers and motivations for utilising DT**.** In particular, this study has identified an opportunity for appropriate training of the educators to extend their awareness of the principles of DT.

Originality

This research has identified four novel and distinct ways in which DT can be integrated with(in) EE. This allows educators to be more reflexive about why and how they utilise DT in their classrooms, addressing an apparent lack of this understanding in contemporary practice.

Key Words: entrepreneurship, educator, design-thinking, qualitative, educator-centred perspective, innovation.

Introduction

Since its foundation, Design Thinking (DT) has gained global attention and has emerged in a variety of educational contexts, including facilitating entrepreneurial behaviour. Entrepreneurship Education (EE) is considered to be a pioneering field in the implementation of DT in education (Sarooghi *et al*., 2019). Recent developments, such as the EntreComp Playbook describing DT as one of the three most important entrepreneurial methods (Baciagalupo *et al.*, 2020), have influenced the increasing use of DT in EE curricula, .

The wide use of DT within entrepreneurship curricula has been confirmed and quantified (Kremel and Wetter Edman, 2019). While practitioner literature consistently recommends tools and principles from DT as being of value to EE (Neck *et al.,* 2021), the ways, motivations and challenges for employing DT in EE remain insufficiently eludicated in the literature (Sarooghi *et al.*, 2019). Current research trends often justify the increased use of DT in EE from the learners' perspective, overlooking the educators' insights and experiences.

This study moves beyond proposing the increased use of DT in EE or assessing its general effectiveness (Sarooghi *et al*., 2019). Instead, this study adopts an educator-centred perspective, as recently suggested by Wraae *et al*., (2021) and Brush *et al.*, (2024).

Using a constructivist lens, this study explores how entrepreneurship educators integrate tools, processes or principles of DT – either consciously or unconsciously – into their constructions of educational practice. It also examines the motivations behind these integrations, the perceived value of DT and the challenges and critisicm educators face. By utilising existing conceptualisations on the nature of DT (Cross, 2023; Auernhammer and Roth, 2023; Dell'Era *et al*., 2020; Micheli *et al*., 2019) this study contributes empirical insights into what the entrepreneurship educators believe is happening in their education practice. This interpretive and constructivist approach aims to address the research question 'How do educators apply and/or integrate DT into EE?'.

Literature Background

A review on the conceptual discussion on DT

The study of design theory has delved into the designer's thinking process for the last 50 years (Dorst, 2011; Simon, 1969) and since then various viewpoints have been employed to define the concept of DT. Within the past decade the use of the term has increased and the meaning of DT has evolved (Cross, 2023), widening the meaning and use of DT as being 'for' something other than design, e.g. "DT for EE". Recent characterisations include structuring the perspectives of DT as (1) a methodology, (2) the thinking of designers, and (3) practice-based DT (Auernhammer and Roth, 2023) or differing between "DT" and "Designerly Thinking" (Cross, 2023).

The myriad definitions of DT reflect the concept's richness and the diversity of perspectives (Auernhammer and Roth, 2023). Scholars have labelled DT the "reverse problem" of other academic concepts, noting its lack of conceptual clarity and theoretical rigor while retaining practical relevance (Micheli *et al*., 2019, p.143). Despite its long-standing presence, the question "What is DT?" remains prominent (Auernhammer and Roth, 2023). Key themes in widely accepted conceptualisations of DT include Wicked Problems and Problem Solving (Dorst 2011), Prototyping and Iteration, (Christensen, 2009), Empathy and Human-Centredness (Kimbell, 2011), Interdisciplinarity and Collaboration (Brown, 2009) and Creative Confidence

(Owen, 2007). This study aligns with Brenner and Uebernickel's (2016) understanding of DT as a *mindset*, enacted through practices (*tools*) within a systematic *process* that fosters innovative problem-solving, consistent with the wider corpus of work by Carlgren *et al*., (2016), Dell`Era *et al*., (2020), Elsbach and Stigliani, (2018), Micheli *et al*., (2019) and Klenner *et al*., (2021). This complexity of DT definitions and myriad perspectives encourages the construction of individual interpretatios by practitioners that is rarely reflected in studies of DT integration.

DT in entrepreneurship´s education practice

Previous literature has demanded a broader role of DT in the business school curriculum (Glen *et al*., 2014; Glen *et al*., 2015) and specifically in EE (Sarooghi *et al*., 2019; Klenner *et al*., 2021). Despite shared philosophical roots and practical commonalities, the discourses on DT and EE have developed in isolation. Early works focus on a practitioner-oriented perspective, discussing, e.g. exemplary course designs (Nielsen and Stovang, 2015) or introducing new methods within this context (von Kortzfleisch *et al*., 2013). Some papers provide initial ideas on the topic, but lack comprehensive answers (Huber *et al*., 2016; McLuskie and Dewitt, 2019; Tselepis and Lavelle, 2020). Recent advances include the search for a unifying logic in practice (Linton and Klinton, 2019); defining elements of a design-based EE at universities (Sarooghi *et al*., 2019) and proposing a novel 'DTE' model for DT within EE (Hölzle, 2022). This literature indicates common elements in DT and EE, including educational philosophy, key competencies, teaching methods, and pedagogical approaches (Schneider et al., 2023). However, it fails to adequately describe how this integration can occur, leaving a gap in both theory and practice.

Importance of the educator's perspective

In EE, the educator's role is pivotal (Toding & Venesaar, 2018), necessitating that contemporary educators subjectively determine what and how to teach (Henry, 2020). Recent studies using identity theory provide insights into factors shaping the educator's role (Wraae et al., 2021; Brush et al., 2024). Diverse educational theories, such as constructivism, explain the choices educators make; DT can facilitate individual knowledge construction and foster collaborative learning. By employing DT in EE, educators create frameworks for group tasks and acknowledge the customer as an active participant, promoting meaningful interactions, as outlined by Lave and Wenger (1991).

Moreover, DT aligns with theories of experiential education, offering structured processes for experimentation, reflection, and application. The tools of DT, including frameworks and models, facilitate choices about emulating experiences, debriefing discussions, and connecting experiences to broader concepts. Additionally, DT helps mitigate cognitive load, breaking complex entrepreneurial issues into manageable parts while providing clear instructions and minimizing distractions (Santiago & Guo, 2019). Although numerous studies have examined the effectiveness of DT in EE, few have empirically explored how educators integrate it into their courses and educational practices.

This approach provides a new perspective, moving beyond the prevalent focus on learners as knowledge constructors. This is needed because there have been scarce insights in the field on who the entrepreneurship educators are and what perceptions shape their teaching, with few exceptions (Toding and Venesaar, 2018, Wraae *et al*., 2021; Brush *et al*., 2024). As EE has evolved from different fields (Fayolle and Gailly, 2008), educators come from diverse

backgrounds, with many lacking formal training in educational theory, raising questions about how their practices are informed by theoretical or empirical foundations..

As such, this study utilises a constructionist lens and sets out to gain empirical insights that address the research question 'How do educators apply and/or integrate DT into EE?'

Methodology

The choice of an exploratory, interview based, research approach is motivated by three factors: firstly, the limited existing research on this topic, necessitating an element of inductive theory building (Johnson and Christensen, 2014) in order to investigate unknown variables (Creswell, 2003), in this case how the educator applies and/ or integrates DT into EE. Second, interviewing reflects an alternative empirical approach that captures the practice of the educator. This provides complementary insights to the predominance of conceptual or single-case studies in prior research on DT in EE that focus on the benefits of DT, as shown in Appendix A (Huber *et al*., 2016; Linton and Klinton, 2019; Nielsen and Stovang, 2015). Thirdly, the need to investigate the phenomenon in an open-ended manner with a view to engaging a flexible and inductive research logic (Denzin and Lincoln, 2012), necessitated an approach with the possibility to dive into the respondents' narratives of their worlds. Semi-structured interviews allow for this much needed development of understanding and explanations based on interpretations of observed data (Kyrö *et al*., 2013), guiding qualitative research (Brinkmann, 2013). Thus, qualitative, semi-structured, in-depth interviews were conducted, and analysed through inductive coding to support the need to build theory in this area.

Data collection

The educational practice of DT in EE is described by diving into multiple realities and different perspectives. Thus, this study critically explored the complexity and embraced the richness of differences by exploring and analysing the perspectives of 29 entrepreneurship educators. This reflects the interpretative approach and is based on the claim that the role of DT in the facilitation of entrepreneurial behaviour can only be understood through understanding the meaning for the entrepreneurship educators involved (Kyrö *et al*., 2013).

29 semi-structured interviews were conducted from a purposive sample of entrepreneurship educators from 24 higher education institutions in Europe. The geographic scope was focused on northern countries of Europe where the researcher could conduct interviews in their fluent languages of English or German. This included Sweden (8 Participants), Germany (7 participants), United Kingdom (9 Participants) as well as the Netherlands (3 Participants) and Denmark (2 Participants). The educators were eligible if they had three years of experience teaching in the field, either at a university or a polytechnic university. The interviewees were of varied experience, being evenly distributed between 3 and 20 years experience of teaching entrepreneurship in higher education.

Participants did not have to define themselves as having experience with DT but rather the study sought to discover their use of tools, processes or principles of DT in EE, whether they were aware that these were from a DT tradition or not. In line with the purposive sampling method, the first question in the interview explored the educator's own conceptualisations of DT and which tools, processes or principles of DT were being used, employing an established list based on the work of key authors Carlgren *et al*., (2016), Dell`Era *et al*., (2020), Elsbach

and Stigliani, (2018), Klenner *et al*., (2021), Kremel and Wetter Edmann, (2019) Micheli *et al*., (2019) and Sarooghi *et al*., (2019). In addition a slide with the list of tools, methods and models of DT was prepared (as described in Data Collection above) to help the participants to recall or connect commonly used tools or processes of DT with that label, should they still face this difficulty after the broad questions or prompts were posed.

The interviews were conducted and recorded online via Zoom with participants' consent. They explored each educator's perspective on Entrepreneurship Education (EE) and their specific use of Design Thinking (DT) in the classroom. A broad set of questions aimed to elicit educators' conceptualizations and experiences with DT tools, processes, or principles, even if not explicitly identified as DT. Central to the study was understanding how educators integrated DT into their teaching, including unconscious or unintentional uses. Educators were also asked what DT meant to them, allowing their responses to be coded against established academic definitions of DT.

Data analysis

Data was analysed using an iterative process of inductive coding, where saturation was thought to be reached before the 24th interview, but five additional interviews tested and confirmed that assumption. Data analysis was undertaken according to processes from Miles and Huberman (1994), Saldana (2013) and Breakwell *et al.,* (2000). Patterns, themes and categories are built from the bottom up by organizing the data from small fragments to form abstract units in an inductive process (Creswell, 2014) as shown in Figure 1.

INSERT FIGURE 1 HERE

Figure 1. Flow chart of the coding process

The coding process used the first 4 transcripts for open coding, coding the rest accordingly and developing new themes as they emerged, noting codes relation to the interview prompts and research question. Further codes were formulated based on the themes and dimensions identified in the literature review. DOVETAIL, a code-and-retrieve program, was utilized to facilitate the coding and categorization of text transcripts. A thematic approach allowed text to be coded, retrieved, and revisited for further examination (Brinkmann and Kvale, 2018; otherwise known as pattern coding (Breakwell, 2000).
The identified codes and themes were visualized and drawn into thematic maps as well as conceptually clustered matrixes, following Saldana's (2015) process of transformation, helping to rationalise data from transcripts of the 29 interviews into a coherent collection of themes that enabled conceptual theory building. The full list of codes can be seen in Appendix B.

Findings - General Observations on implicit and explicit use of DT

This section introduces general observations on whether Entrepreneurship Educators do integrate and use DT practices in their teaching.

The coded responses related to Course Design and definitions of Design Thinking (DT) came directly from the semi-structured interview questions, addressing first whether and then how educators integrated DT into their Entrepreneurship Education (EE) practices. Additionally, a

significant number of codes were associated with contextual themes such as the Role of the Educator, DT Perspective, as summarized in Appendix B.

The first result of this study was that DT and DT Principles were integrated both explicitly and implicity. Explicit integration refers to the clear and plainly stated use of DT in EE courses or curricula, while implicit integration means that the principles of DT are applied without being explicitly stated. Nearly all participants mentioned either explicit or implicit use of DT in some form. While some participants denied teaching or applying DT explicitly, they often touched upon this topic again later in the interview, reflecting on their possible implicit use of the DT principle, tools or processes. As expressed by Participant 8:

> *"Why I have not yet integrated Design Thinking…maybe because ... but I, I think I partly do it ... so maybe it is there implicitly" (8)*

And similarly by Participant 9:

> *"I consciously don't use Design Thinking, right. But I use tools that you will also find in Design Thinking, but when I started out teaching I didn't realize that there was anything called Design Thinking" (9)*

The analysis of data coded under 'course design' revealed that Entrepreneurship Educators applied and/or integrated DT differently to each other – generally utilising only one form of integration. Of particular significance was the educators' reluctance to describe their specific educational practices. When asked about their teaching style, practical and theoretical approach in the classroom and how they integrated or practiced tools and models of DT, very few specific practices were volunteered, with the common exceptions of 'prototyping', 'customer empathy' 'problem understanding' and 'ideation'. It appeared that participants struggled to clarify which DT tools they use in their teaching because they lacked confidence to label the as DT.

Findings - Ways of DT integration in EE

While the general findings show that there was some diversity in the extent to which Entrepreneurship Educators described their practice as DT, all of the Entrepreneurship Educators were seen to integrate tools, processes or principles of DT broadly as one of four constructions or 'integrations' of DT into EE.

Having determined that there were both implicit and explicit forms of integration, this section utilises the four different forms of integration as a way to present the remaining findings, pointing out the educational practice, the way in which this form of integration differs from others and the barriers and criticisms to integration of DT in EE. The role of the educator and the value of integrating DT are noted where these were mentioned by interviewees in relation to these integrations. To aid understanding of the following section, Table I illustrates these four integrations, with DT displayed as the blue element and the level of integration within the Entrepreneurship Course displayed in grey.

Table I: Four forms of DT integration in EE

INSERT TABLE 1 HERE

For more information see Appendix C

Selective – integrating DT tools in an opportunistic manner:

Analysis of the interviews identified that educators adopted a selective and occasional use of *tools* commonly associated with DT, rather than it being an organizing framework for their teaching. This viewpoint of DT as being a toolbox for both students and educators was common. These educators were making use of DT in a scattered, selective and self-directed way. Educators reported adapting the tools to fit their own purposes and integrated them in an occasional and opportunistic way into their Entrepreneurship Teaching. The need for easy to use tools was especially highlighted when the teachers reported feeling inexperienced or "being thrown into teaching".

Practices of selective integration

Educators expressed the value of DT as fulfilling their need for interactivity and entertainment within the classroom. Key tools that the educators noted were prototyping tasks, use of iteration, creativity activities like brainstorming, customer empathy and problem understanding tasks as well as structuring tools associated with a linear process of DT, such as concept maps or customer journeys.

> *"There's number of tools along the way, which I sort of stolen from Design Thinking as well, I mean, on the way they do prototypes(..) and all these classical Design Thinking tools ... so in that sense, I use Design Thinking elements. I do not sort of subscribe to Entrepreneurship Education as a Design Thinking logic. I can steal from design thinking, I can steal from a lot of other places. And Design Thinking is definitely one of the places we steal most from. But it is not sort of the central logic of the course" (10)*

> *"But we don't really call it Design Thinking (..) but we basically take parts of it to make the lecture" (15)*

Thus, participants reported opportunistically using DT tools wherever they might need a tool to support their teaching. Of particular note, some educators implicitly integrated DT Tools without consciously considering themselves as using the tools of one discipline to teach another. In contrast Participant 5 acknowledged applying Design Thinking as a tool even though this might neglect the theoretical foundation of the concept:

> *"You can see it as a tool that you use ... but think that is kind of making a little bit of violence towards the fundamentals of what Design Thinking aims to be...I don't know…But it's, of course, we use a lot of tools in entrepreneurship, or at least we call it tools. It's catchy. It's easy to learn, and it's easy to apply." (5)*

This participant reflected upon the possible misconception of DT as a Tool, while also acknowledging the value of the ease of application. Another reoccurring sub-theme in this DT practice was that Participants stated that the students had to decide for themselves when and where to apply DT tools, bringing back the concept of students as constructors.

Motivations, Value and Challenges of a Selective integration

From the interviews it became apparent that the value of a selective integration lies in turning an idea into something real using tools like prototyping tools or interactive workshop methods. Some entrepreneurship educators valued the fun and interactivity of workshop tools from DT, fulfilling both their need for entertainment and the student´s need for interactivity.

> *"and to have fun in the lecture ... and I have a lot of fun"(17)*

On the one hand, integrating DT methods in a selective way fulfills the educator´s desire to utilise simple and interactive tools, but this endeavour for simplicity was also critized by other educators. For instance, Participant 6 questioned whether educators use DT Tools in a selective manner because "*they just want something meaningful to do with their students*" as *"you know, it can make for some fun, creative moments for people, but does that throw them into entrepreneurial processes?"*. This Participant noted that DT provides "*simple tools*" which make "*workshops interesting*" and which the "*students like and makes teachers happy*" but may not deliver relevant knowledge on entrepreneurial processes:

> *"There is a need for simple tools out there and Design Thinking is answering this need" (6)*

On the other side, DT advocates acknowledged this critique but disagreed with the notion that DT is a simple construct, even though they acknowledge the value of also being *"easy at first sight"* (7).

One of the most frequent criticisms of the selective integration of DT was the perceived lack of theory and the tendency of simplification. Participants described a *"reduced focus"* and being a *"hands-on approach"* (14) and being an *"eclectic collection of ideas from a practitioner-oriented field"* (6). Connected to the lack of theory is the critique that DT simplifies complex concepts. Participant 14 shared this viewpoint on simplification:

> *"So it's design thinking, it's the short work cycles, loops, iterations - very simplified ideas of things. So I don't know, you can simplify, but not to this amount" (14)*

Participants agreed that the selective integration of DT methods allows educators to turn ideas into reality using practical tools like prototyping. While these tools make learning fun and interactive, some educators question whether this approach truly immersed their students in DT or entrepreneurial processes. Critics argued that the simplicity of the tool might undermine the delivery of deeper knowledge, whereas advocates appreciated their initial ease of use. In the next type of integration, the phase of the integration, rather than the extent of integration, was commonly highlighted.

Idea-Centric – integrating DT in the early ideation process within an entrepreneurship course:

While some of the participants criticized commonly-used linear models of DT for their simplification, many reported applying and integrating DT during the problem phase (Ideation phase) to foster the problem understanding among the students and engage with the concept of a 'customer'. Participants indicated that they employ DT initially in order to develop an "idea" which later evolves into a greater focus on business model generation - a method in the

beginning of an (often project-based) Entrepreneurship course. The behavioral practice of including DT in the beginning of an EE project-based course was often connected to the predominant perception of DT as a toolbox or method for early phases such as Problem Understanding, Ideation and Idea Development. This differs from the selective integration in that it is limited to the early stages of a course.

Practices of idea-centric DT integration

Educators often described a project-based course structure where the goal was for students to work in teams, generate an idea that addresses a problem and then move into content and theory more familiar to EE, by introducing the concept of a business model to deliver this solution. In this practice, educators utilised DT tools as a procedural toolbox to support the process of Problem Finding and Ideation among the students. Hence, the educators described DT use in an early phase to understand the problem.

"I use Design Thinking in the start, rather in the beginning of the entrepreneurship course journey, then at the end" (15.

"Pretty early on, I think because it is about how you conceive the things you are going to design like the problem you are trying to design for ..." (4)

Furthermore, participants acknowledged using DT only in the intial stages, in order to develop an idea which will at a later stage, transform into a greater focus on business model generation:

"Design Thinking is like before that, but it leads into a business model"(17)

The practice of including DT at the beginning of an Entrepreneurship Education project-based course was often connected to the predominant perception of DT as a toolbox or method for early phases such as Problem Understanding, Ideation and Idea Development. This aspect has been expressed by Participant 4:

"I would say in the idea evaluation course (..) we used material by IDEO to help present that and we walk them through sort of the concept space (..) and the iteration (..) Those will be the only specific, I would say Design Thinking slides that I've ever utilized in education. (4)"

Other participants described their understanding of the nexus between EE and DT as having the most similarities within the early, rather chaotic, phases of entrepreneurship as stated by participant No: 13:

"I do see the similarities mostly in the kind of the very first process parts"(13)

Thus, this educational practice reflected the conceptual understanding of DT as toolset supporting creativity and concept development.

Motivation, Value and Challenges of the Idea-Centric Integration

The motivation to apply an idea-centric DT integration centred around enhancing problem understanding and recognising the value of DT in providing tools and processes for ideation

and the integration of multiple perspectives, despite critiscm questioning the applicability for certain contexts.

Participants explicitly discussed the value of DT in focussing on ill-defined problems (wicked problems) and the need to understand the problem before focusing on the process of finding a solution

> *"Design Thinking is just the best approach I have seen so far, to really understand the problem. So that's why I think I use design thinking" (15)*

> *"People have to understand or have to find ways to recognize opportunities and Design Thinking can help through, to learn need finding, and to see problems and needs as opportunities" (20)*

> *"(Design Thinking is about.) Finding problems. That do matter" (2)*

Many participants associated DT with a unique strength in divergent thinking and constructed their approach around a perceived value of DT for fostering creativity and ideation, providing a framework for students to creatively "explore, test and refine" ideas in a sense of providing *"creativity tools"* (Participant 23).

While idea-centric integration was common, some participants rejected the value of DT for enhancing the problem-understanding and ideation within their specific context.

> *"And the problem I have is that ideation ... we have also to care about new technologies coming into that ideation thing ... if you do tech entrepreneurship you have to acknowledge that things come not only through the design process of trying to understand what problem to solve for the customer" (1)*

Participant 11 described the perspective that DT would *"work when you do a consumer product"* but would not be suitable for the entrepreneurial context of *"hardcore medical or medical drug development"*. The main criticism has been that the unique focus on the 'human-centred' perspective towards innovation implies a certain bottom-up perspective that is not applicable for every context.

Ideation, as a focus for the integration DT into EE, was presented as both a challenge and an opportunity. It was commonly utilized and found useful in providing learners with a new perspective on the concept of the customer, though it was found limited in its usefulness in certain contexts. The next level of integration, viewing DT as a comprehensive process, extended beyond using DT merely as a phase in EE. This approach incorporated a broader range of DT principles and practices throughout the entire course.

Procedural focus – Making use of DT as a process for the entrepreneurship course:

In the third integration, a number of participants described DT as the "backbone" or the "skeleton" of their Entrepreneurship Course. For instance each week they focussed on a

different process step, such as empathy, define, prototype etc. Analysis of the interviews suggested that these Entrepreneurship Educators understand and practice DT as a process and the theories and tools of DT provide a framework upon which construction of practice occurs.

Practices of procedural focus integration

Interviewees described using the DT process as an overall structure, while adapting it to their needs and internalizing its principles, guiding their own understanding of being an Entrepreneurship Educator. The first of two distinct approaches was DT as a backbone of the course utilised by the educator, which allowed a flexible approach to which content was delivered at which point, as demonstrated by Participants 14, 23 and 7.

> *"Design Thinking is the backbone of this ... program at our university"(14)*

> *"Sometimes I structure the teaching week by week – so the first week is empathizing, the second week is defining, so every week is structured around (DT) process" (23)*

> *"We are actually in a Design Thinking process during the course ... we have the Design Thinking process going on all the time" (7)*

In assesssing the participants responses, it became clear that educators who had less experience with Design Thinking appear to follow notional "rules" and "processes" of Design Thinking more strictly than Design Thinking´s attributes of fluency and flexibility might require.

Motivations, Value and Challenges of the procedural integration

The value of DT in providing structure to different phases of the Entrepreneurship Course was a recurring theme. Educators reported the utility of DT in organising "messy things" and offering a way to organise the eclectic content typically expected in an entrepreneurship course. Some participants also echoed the self-directed constructions of DT Process by the students e.g., by making use of DT in setting where e.g., *"students teach students"* (7).

The motivation for, and value of, this integration was about aiding understanding by following a logical pattern, both learners and the educator.

> *"I mean one of the things I do love about it is the structure ... It gives structure to what is a very messy thing, you know creativity and ideas. It kind of feels so vague. So yeah, ironically, it's the structure that I think is really valuable because it gives shape to those ideas" (23)*

Participant 23's mention of "irony" reflects the perception of DT being torn between being truly iterative and non-linear but still following a sequential logic of procedural phases.

As shown in Table 1, the procedural integration places DT throughout the EE course. The next integration takes this further, with DT seamlessly sitting alongside EE to create a coherent whole.

Holistic: Internalizing DT principles as a way to approach teaching entrepreneurship

The final integration was demonstrated by those entrepreneurship educators with a strong background in DT who communicated the influence of DT on their own construction of meaning of what it means to be, and practice as, an educator. They perceived DT as overarching guiding principles, used as a conceptual framework for all of their entrepreneurship courses. They reported being less strict in following a systematic process of DT and adopting it as their "way" or culture of doing things. They appeared to integrate DT Tools and Processes throughout their educational practice in an intuitive manner and none of the interviewees mentioned applying a linear framework or conscious mode of integration. These educators reported enacting DT as their approach to education in general and thus applying design principles they derived from DT.

Practices of the holistic integration – educator as designer

Entrepreneurship educators with a strong background in DT communicated its influence on their own understanding as an educator. Thus, they perceived DT as overarching guiding principles which they used as a conceptual framework for all of their entrepreneurship courses.

> *"So, I think this changed the way I positioned myself also as an educator. So how I design and what my role is, is heavily influenced by design thinking" (20)*

Participant 18 – a DT advocate – described its holistic approach of integrating DT within Entrepreneurship Education by making a reasoned use of all the different levels of DT:

> *"I mean, every lecture is a prototype. ... a lecture prototype can only be tested with students. And for me, that's living that prototyping principle" (18)*

Again, prototyping was specifically mentioned – but in this context making use of "Prototyping as a Principle" within the classroom by seeing every lecture as a prototype itself and further reported enacting the design principle of "Human-centredness" in their educational practice by empathizing with students in the phase of course design, taking a servant role, and in general embracing "student-centredness". For a select few respondents, mostly those with a strong theoretical and practical conceptualization of DT, it was seen as a foundational principle of their construction of understanding what and how to teach EE.

> *"When I think of Design Thinking, I´m thinking of how we design entrepreneurship courses" (3)*

> *"Design Thinking did change my own teaching (...) And the way I teach" (20)*

> *"As I said, people have to be at the centre of whatever I do. So when it comes to Design Thinking, you´ve got to design your teaching and your assessmets around people" (26)*

Further, it became apparent from the data, that while experienced DT advocates apply DT Principles as their guiding educational principles, some rather inexperienced educators still reported using DT to fulfill their need for educational guidance in their Entrepreneurship Teaching practice. Thus, a new theme emerged from participants who described DT as a bridge they used to develop their way of teaching. Especially Participant 7 very openly reflected upon the development from being an *"insecure young teacher"* that *"imitates what you have seen other teachers do"* into a teacher that has a "*huge reservoir of different methods right now*" .

> *"It did change my own teaching because I got new methods and I got a new structure and I got a new logic and I got new theories to present. ... So Design Thinking is a very different approach. And of course, it has changed a lot. And the way I teach and also the way it facilitates and yeah, everything. And suddenly you have specific literature that frames the whole thing, and that also makes it linked up to a business way of thinking" (7)*

Motivations, Value and Challenges of the Holistic Integration

Participants described DT as a new "semantic toolbox" for their own understanding of their practice and a vocabulary to communicate what they do in Entrepreneurship Education – which motivated them to integrate an holistic perspective.

> *"I've got an access to a new semantic toolbox for describing what I do"(6)*

> *"This is something I've done before intuitively and since I know Design Thinking I do have a permission of it because it has a name"(23)*

Whether described as a language, a semantic toolbox or a permission to do things, Entrepreneurship Educators emphasized the role of DT in providing a "common language" with other disciplines. Participants mentioned referring to applying DT as a way to communicate the value of Entrepreneurship Education.

When reflecting on DT's value from an educator's perspective, participants mentioned translating the design principle of "human-centredness" towards their context of teaching by applying a "student-centredness". Educators emphasized the central role of the student comparing their student-centeredness' with being "customer-oriented" – wording retrieved from the DT Vocabulary. Conversely some participants criticized educators who saw DT as *"kind of an overarching philosophy of everything" and "is presented as the only solution"* (Participant 23). The holistic integration of Design Thinking was therefore critized, with some comparing it to a "religion" due to its perceived one-sidedness. A recurring theme in the interviews was the characterization of Design Thinking as a fad or buzzword, with many participants expressing concern over its superficiality and trendiness. Additionally, some educators feared that Design Thinking could overshadow or replace Entrepreneurship Education, reducing it to oversimplified, competing approaches.

Discussion

This study enhanced the understanding of integration approaches from an educator's perspective. The use of the qualitative perspective uncovered assumptions taken for granted by scholars (e.g., Campbell, 2020) that differed from educators' classroom reality and how they integrate DT into entrepreneurship teaching. The findings demonstrate that although integrating

DT in the critized linear pattern (Auernhammer and Roth, 2021) appeared to be common practice, educators exhibited much variation in the level of DT integration.
The majority of entrepreneurship educators in the study perceived and practiced DT primarily as a process, contributing to the ongoing debate on the untapped potential of DT resulting from the oversimplified interpretation of the concept (Dell'Era *et al*., 2020; Auernhammer and Roth, 2021). This also contributes to recent discussions on the need for clearer constructs and critical examination of DT (Auernhammer and Roth, 2021).

'Selective Integration'
The adaptability of DT Tools into the EE context demonstrates a conceptual aspect that has been diluted from the original intention, observed in this study and in previous studies (Klenner *et al*., 2021). This underlines the fact that DT has manifested in the practice of facilitating the process of the innovation tasks of entrepreneurship as a tool (Brown, 2008; Liedtka, 2015). Further, the participants' criticism of a superficial integration is supported in the literature (Sarooghi *et al*., 2019).

The notion of prototyping as a popular tool in the selective integration was widely perceived as a valuable DT element. Prototyping is not only an important step in most DT processes (Boland and Collopy, 2004; Brown, 2009), but embraces the attitude of experimentation (Brown, 2009) and characterizes Prototyping as a thinking mode. DT has claimed to innovate educational practice by introducing prototyping as a mindset, connecting the thinking about and doing of things (Henriksen et al., 2017). Described as a "methodology of enablement" (Welsh and Dehler, 2012 p. 773), prototyping supports students in developing possibilities and envisioning the possible. This emphasis on tangibility and prototyping as a principle was perceived by many Entrepreneurship Educators in this study as one of the most predominantly valuable aspects of DT.

Even though this study has outlined that DT is often associated with and referred to as Prototyping, previous research has shown that prototyping is a less prevalent element, possibly due to the lack of physical infrastructure (Sarooghi *et al.,* 2019). This argument was echoed in this study as some educators mentioned their dependability on scarce university resources as a barrier, e.g., maker spaces or prototyping labs.

'Idea-centric'
As one of the reoccurring themes, the interviewees emphasized the strength of DT in the phase of "Problem Understanding". This has been well evaluated and described within the literature (Dorst, 2011). The benefits and perceived value of an idea-centric DT integration in Entrepreneurship Education mirror those benefits presented in prior studies, in particular the value of prototyping, interdisciplinary or student-centeredness (Huber et al., 2016; Linton and Klinton, 2019).

Based on the ideas of Rittel and Webber (1973) and Buchanan (1992), the design process has distinct phases differing between problem definition and problem solution, an idea which has been widely translated in the Double Diamond Model (Design Council, 2005). While simplification was recognised as a problem, a significant number of Educators reported applying and integrating DT during the problem phase, especially with the goal to foster the problem understanding among the students. This is supported in the literature where DT is envisioned as especially useful in the beginning of a practice-based innovation process (Klenner *et al*., 2021). Exemplifying this approach, DT has been described as a "useful front end to the new approaches to entrepreneurship in giving students a more useful guidance on how to carry

out a productive and user-centred ideation process" (Glen *et al*., 2014; p. 662). This view was confirmed by a group of respondents who focused almost entirely on DT as a process for ideation. In short, the approach works for the learners, and the educators therefore construct their practice in such a way as to maximise this success with apparently little understanding as to 'how' or 'why' it works.

The mentioned criticism on the missing suitability of the human-centred approach e.g. in tech entrepreneurship contradicts studies that conclude the value of DT in driving a novel change of perspective towards the user focus, especially within fields of study which are traditionally product-focused (Lynch et al., 2021) and again suggests a construction of practice around a preference for or against DT by the educator or the learner, rather than a theoretically founded framework.

Procedural integration

DT process elements have been widely spread among theory and practice (Buchanan, 1992; Brown, 2008; Razzouk and Shute, 2012) and even though models differ regarding the number of steps and stages, DT itself often being a socially constructed concept (Pande and Bharathi, 2020), all models of the DT Process are characterized as being iterative, recursive, non-linear and human-centred. This reference to DT as the scaffold or skeleton fits with studies that confirm DT as a useful mental model for abstract conceptualization when students experience uncertainty when facing ambiguous and unstructured "wicked" problems in the entrepreneurial context (Glen *et al*., 2014). However, the weaknesses of relying too much on the process perspective and understanding the process as a clear or linear step-by-step approach are obvious if entrepreneurship is seen as a 'wicked problem' (Buchanan, 1992). Prior studies have questioned whether Design Thinking could be credibly implemented through a step-by-step process in a linear 'cookbook' pattern (Auerhammer and Roth, 2021). This construction of DT as a linear process can be understood as underestimating the principles of iteration as well as ignoring the demand to teach entrepreneurship as a method instead of as a process (Neck and Greene, 2011). Even though procedural elements are key to the DT construct and DT has been previously portrayed as a human-centred problem-solving process (Brown, 2009; Liedtka and Ogilivie, 2011), the reductionist approach of only focussing on the process misses the potential of a human-centric understanding of DT principles over processes (Auernhammer and Roth, 2021). As such, this schema further evidences a selectively understood or applied theoretical foundation in the construction of educational practice.

Holistic integration

Alongside the conscious or unconscious adoption of DT as a holistic framework for education, the study identified the self-conceptualisation of some educators as being a "Design Thinker" while others saw it purely as a tool or framework, raising again the role of identity theory in understanding the perceptions of the educator (Brush, *et al.*, 2024; Wraae, *et al*., 2021). Following the conceptualisation of Klenner *et al*., (2021) this is defined as a "Designerly Way of Teaching Entrepreneurship". This has been previously reflected within the literature as the application of DT as a teaching approach (Neck and Green, 2011; Nielsen and Stovang, 2015) (Lynch *et al*., 2021) and evidences the role that theoretical grounding in one discipline can influence education practice in another. However, the idea of DT being used as a semantic toolbox or translator/mediator between disciplines has not been previously identified in the literature and bears further investigation. This supports the role of DT in bridging and embracing interdisciplinarity as a key theme (Welsh and Dehler, 2013) but with a new outlook. The themes relating to communication reveals another important function of mainstream

approaches, as they provide a new and common vocabulary to interact and communicate with various disciplines in the business context.

While the select few were cogniscant of the deeper application of DT, this interview study has underlined the reality that some Educators are not aware of the underpinning educational philosophies which drive and direct their educator´s practice (Hannon, 2006; Bell, 2021). DT was used to bridge a vacuum of educational guidance and this endorsed the observation that Entrepreneurship Educators have often been left alone in finding their way into pedagogic practice (Lackéus *et al*, 2016; Neck and Corbett, 2018). As stated by Hannon (2006, p.299), it is crucial for Entrepreneurship Educators to depict a personal philosophy to *"understand the need for underpinning philosophical frameworks that enable a greater understanding of why they do what they do in the way they do it"*. However, many educators do not articulate or explicitly choose a philosophy or theory of learning (Bell, 2021) even though the awareness of this choice contributes to professionalism (Merriam, 1982).

Implications for educational practice

Entrepreneurship educators constructed diverse understandings of the role of DT in their practice. Without attempting to judge the success of each participants' practice, the review of theory suggests that understanding the principles is more important and more effective than just applying the tool(s). Whilst experienced DT practitioners reported a flexible, natural and intuitive integration of DT within their Entrepreneurship Teaching, others appeared to use DT as a crutch to overcome feelings of inexperience, or to overcome the 'messy' nature of EE. DT clearly played a role as a bridging construct for some inexperienced educators who were in search of practical and theoretical guidance on how to design their Entrepreneurship Courses. The twin challenges of lacking experience and lacking formal theoretical grounding suggests that there is a fundamental learning need, as yet unmet, for entrepreneurship educators.
If entrepreneurship educators are expected to deliver DT-based educational experiences for their students as proposed by Sarooghi *et al*., (2019), it is yet to be defined how entrepreneurship educators should be trained in DT. While it might be suitable for practitioners to learn some applicable DT methods in a 2 day-workshop, this approach fails to support a holistic integration, which requires training on the underlying theory and even ontological and epistemological paradigms of each pedagogy in order to facilitate free-flowing and confident construction of practice. Aligned to this is a need for further exploring the underlying conditions required for the construction of practice by the educator, not just construction of knowledge by the student in order to provide the conditions to enact that learning.

Motivations for including DT in educational practice were highly subjective i.e., they related to making teaching and learning easy, logical or entertaining. The same paucity was true of objective measures of the quality or effectiveness of DT practices in EE. Thus the conceptualisation of the four integrations provides a framework to encourage educators to consider 'how','why' and perhaps also 'how well' they teach as they do.

The findings of this research advocate a more profound and conscious integration of DT within EE. As such there is a need for clear guidelines of what DT in EE might look like and the theoretical basis for such, which this conceptualisation contributes to. Given the focus that the EU Entrecomp framework places on DT in EE in the European context, there is a possibility that such guidance and subsequent training could be developed by existing practitioner networks and projects such as entreTime or HEInnovate. Further, the schema of the four different forms of DT Integration in EE encourages not only practitioners but also educational

and entrepreneurial researchers, to articulate their approach when referring to making use of "DT in EE". As such this study provides an organising framework to enable educators to be more reflexive about why and how they utilise DT in their classrooms, addressing an apparent lack of this understanding in contemporary practice.

Implications for theory

The findings of this study illuminate how entrepreneurship educators conceptualize and construct Design Thinking (DT) within Entrepreneurship Education (EE). The educators' definitions aligned with attributes and conceptualizations found in the literature, including themes of problem-solving (Boland & Collopy, 2004; Christensen, 2009), innovation and ideation (Micheli et al., 2019; Dell'Era, 2020), human-centeredness (Brown, 2009), prototyping, and experimentation (Boland & Collopy, 2004; Brown, 2008). However, this study also revealed significant definitional ambiguity in how educators interpret and apply DT in practice.

The findings emphasize a conceptual tension between the principle-centric and tool-centric applications of DT. While principles such as iteration, experimentation, and human-centeredness embody the essence of DT (Buchanan, 1992; Brown, 2009), the reliance on tools like prototyping or specific frameworks often dilutes this foundation (Klenner et al., 2021). This dilution reflects a broader theoretical challenge: the need to move beyond DT as a collection of tools or a linear process and toward a more nuanced, holistic understanding of DT. This lack of coherence echoes debates within the literature about the inconsistent and sometimes reductive portrayals of DT (Rauth et al., 2010; Auernhammer & Roth, 2021). While DT's conceptual diversity enables adaptability, it also introduces challenges, particularly in bridging theoretical definitions with practical applications.

Through a constructivist lens, this study contributes to the understanding of these ambiguities by categorizing educators' approaches into four distinct integrations of DT into EE: **Selective**, **Idea-centric**, **Procedural**, and **Holistic**. These findings extend existing frameworks by depicting DT's application along a spectrum—from using isolated tools to adopting an overarching teaching philosophy—and advances the theoretical discourse to examine pedagogical integration. By mapping these varying levels of adoption, the study contributes to theory and addresses the gap between DT's conceptualization in academic literature and its practical implementation in educational settings. While theories of DT have expanded to consider the thinking of the designer (Cross, 2023) this study has expanded theory into the thought processes and constructions of the entrepreneurship educator.

Additionally, this study engages with criticisms of DT in EE, including a perceived lack of theoretical foundation to its use, oversimplification, and its characterization as a transient trend or buzzword (Abrahamson, 1996; Auernhammer & Roth, 2021). These critiques are reflected in the doubts expressed by educators, particularly regarding the tendency to treat DT as a step-by-step "cookbook" approach rather than as an iterative and principle-driven process. This reductive application risks underestimating DT's potential to address "wicked problems" in entrepreneurial contexts (Buchanan, 1992).

Further, the study identifies DT as a mediating framework that bridges disciplinary boundaries and pedagogical paradigms. This mediating role, while implicit in much of the literature, has not been explicitly theorized. DT's potential to serve as a semantic toolbox or translator between design and other, such as entrepreneurship, disciplines introduces a novel theoretical perspective.

Limitations and further research directions

This study has highlighted the need for additional research, both in the integration of DT into EE and into role that the perspectives of the educator play in EE. Three areas for future research are identified to overcome limitations of this study: The first area is to repeat and expand the study outside of Europe to determine if this level and characterisation of integration applies to other geographies. The second area is to examine whether DT integration enhances EE outcomes. Conducting research that measures the quality of integration and student outcomes would further bridge the rigour-relevance gap (Berglund *et al*., 2018; Finch *et al*., 2018). The results of such a study could highlight both the theoretical rigour of pedagogy and practical outcomes (Mansoori and Lackéus, 2019). The third area is to explore how DT is integrated in non-formal educational settings of the EE ecosystem. This could include case study investigations to delve deeper into the contextual factors that influence the successful application of DT in EE, both in and outside of the formal University education.

Furthermore, the study identified DT as a mediating framework that bridges disciplinary boundaries and pedagogical paradigms. This insight invites further investigation into how DT mediates knowledge transfer, facilitates interdisciplinary collaboration, and supports the construction of educator practice.

Moreover, while an interpretative approach was utilized to seek meaning, there was no objective measure of the educators' understanding of DT. Therefore, the educators' responses reflect their subjective and sometimes partial understanding. To address this, it would be valuable to conduct a reciprocal study involving DT educators who incorporate EE in their practice for comparative analysis.

Conclusions

This study aimed to use a constructivist paradigm of education to answer questions about how Entrepreneurship Educators construct their practices, particularly concerning the integration of DT. The goal was to understand the schemas that they construct in order to encourage learners to, in turn, construct their own knowledge.

The study discovered that DT integrations vary based on several factors, including personal educational philosophy, past experience and the theoretical or practical understanding of DT or entrepreneurship. The interviews challenged assumptions by some scholars (Campbell *et al.*, 2020) on how DT is taught by Entrepreneurship Educators, confirming a discrepancy between the scholarly proposed integration of DT and the enacted practice within the classroom. Furthermore, this empirical study confirms that the constructions of practice can be conceptualised, providing a framework of schema for future educators. Four previously undescribed forms of DT integration in EE were identified: Selective, Idea-centric, Procedural, and Holistic as shown in (Table I). These constructions have not been previously seen, either for the integration of DT or any other theory into EE, and the framework as a whole presents a novel view of the construction of practice.

This study partially addresses Fayolle´s (2013) question about who the entrepreneurship educators are and what they do in their classrooms, and responds to the call to put more focus on the role of the individual educator (Hägg and Gabrielson, 2019) and how their decisions shape the practice of entrepreneurial learning (Henry, 2020). It also addresses the lack of

coherence between the scholarly and practical conceptualisations of DT in educational practice (Carlgren *et al*., 2016). The findings suggest that the integration of DT in EE relies on the educator´s choice, which underlines the central role of the educator´s individual decision (Henry, 2020) and further supports the role of subjective choices within the field of EE (Vanevenhoeven, 2013) especially as made by individuals coming from different fields (Fayolle and Gailly, 2008).

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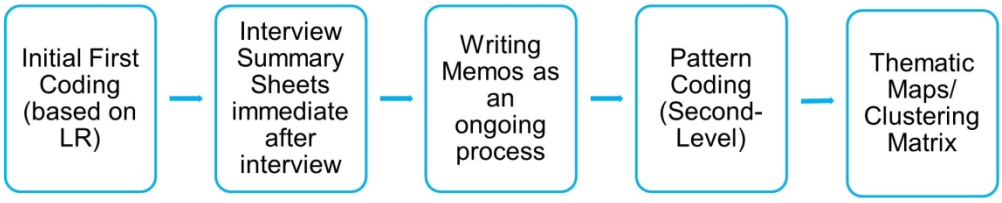

Figure 1. Flow chart of the coding process

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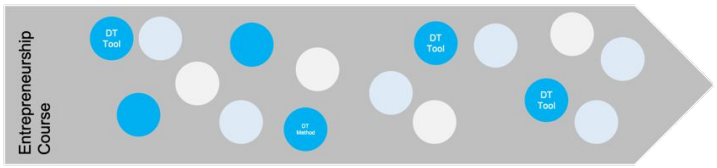
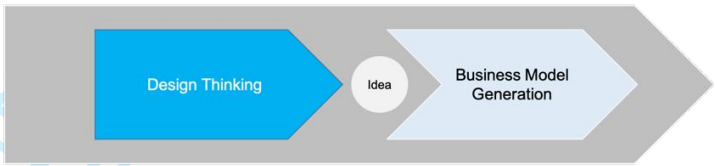
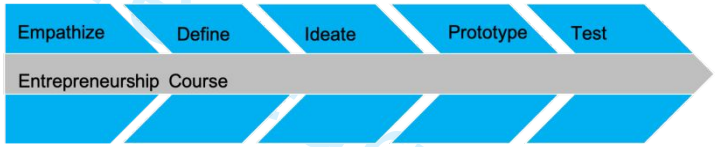
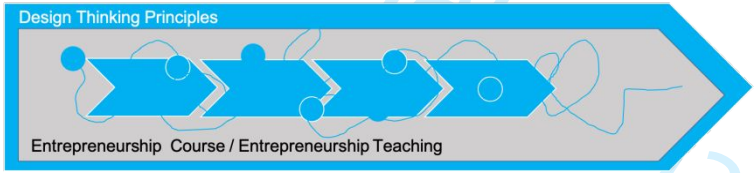
Table 1: Four forms of DT integration in EE

Form of DT integration	Description	Visualization* (see also Appendix)
Selective	Design Thinking is integrated in a selective and opportunistic way, often through use of single Tools/ Methods	
Idea-Centric	Design Thinking is integrated in the (often project-based) Entrepreneurship Course to guide the process of idea generation in the beginning	
Procedural	Design Thinking Process is used to structure the Entrepreneurship Course based on the DT process	
Holistic	Design Thinking is used as overarching guiding principles for the teaching approach and intuitive use of tools or process elements on a principal basis	

For more information see Appendix C

Year	Paper/ Author	Core Ideas	Themes on DT/EE nexus	Type of Study
2013	"Potentials of Entrepreneurial Design Thinking For Entrepreneurship Education" *von Kortzfleisch , H. F., Zerwas, D., & Mokanis, I. (2013). Procedia - Social and Behavioral Sciences*	Entrepreneurial Design Thinking as a "team-diversity-based approach for treating user-centered problems as entrepreneurial opportunities within an iterative process supported by the use of creativity fostering tools and environments"	Entrepreneurial Design Thinking as a new method for the design of entrepreneurship education programs / DT/EE nexus described by: • Similarity of Actors • Environment • Character • Tool	Conceptual (Entrepreneurial Design Thinking)
2015	"DesUni: university entrepreneurship education through design thinking" *Nielsen, S. L., & Stovang, P. (2015). Education + Training*	"The DesUni teaching model ... involves a change in curriculum, teaching methods, use of knowledge, teaching style, teacher-student relations, culture, habitat and assessment" (Nielsen & Stovang, 2015, p. 977)	Design Thinking principles as a new teaching model to form a new approach to entrepreneurship education, including: • Designerly Action • Designerly Imagination • Designerly Mindset Pedagogical Dimension: • Knowledge • Assessment • Habitat and Culture • Facilitated Teaching Design Methods	Conceptual teaching model, Case study test

2016	"Incorporating Design Thinking in Entrepreneurship Education" *Zupan, B.; Nabergoj, A. (2016): European Conference on Innovation and Entrepreneurship; Reading*	The conceptual model of design-thinking based entrepreneurship education by Zuban & Nabergoj proposes 9 components in order to guide course and content design of entrepreneurship courses.	The proposed conceptual model of Design-Thinking based Entrepreneurship Education consists of 9 blocks: Process components: • Fieldwork • Experimentation • Interdisciplinarity • User-centred research Environmental Components: • Tools and spaces • Mentoring • External recognition Other (Basis for success): • Continuity • Meaningfulness of the project	Conceptual model of Design-Thinking based entrepreneurship education based on in-depth interviews
2016	"Design Thinking-Based Entrepreneurship Education: How to incorporate Design Thinking Principles into an Entrepreneurship Course" *Huber et al. (2016): 3E Conference – ECSB Entrepreneurship Education Conference*	Presentation of conceptual links between Design Thinking and entrepreneurship education answering the question: What can we learn from Design Thinking to enrich Entrepreneurship Education	Nine key concepts on the interface including: • Wicked problems • Formalized Design Thinking process models • Divergent and Convergent thinking • Iterations • T-shape • Multidisciplinary teams • Creative confidence • Informed intuition • Studio Learning	Conceptual, Presentation of Course Design Example

2016	"Fostering an entrepreneurial mindset by using a Design Thinking approach in entrepreneurship education" *Daniel, A. D. (2016): Industry & Higher Education*	The article addresses the suitability of 'design thinking' as a teaching approach in entrepreneurship education by using case study research methodology, including a student questionnaire.	Design Thinking Process (six steps) is used as an Entrepreneurship one-semester module strategy Empathy, Interpret, Ideation, Prototype, Test, Implement matched to Entrepreneurial Awareness, Entrepreneurial Skills and Hands-On Entrepreneurial Skills	Case Study & Student Questionnaire
2019	"Implementing Design Thinking as didactic method in entrepreneurship education. The importance of through" *Kremel, A.; Edman, K. (2019): The Design Journal*	Case study of a didactic experience that uses Design Thinking as a method to teach "through" entrepreneurship	Reoccurring themes (no model provided) • Mindset of experimentation and iteration with no fear of failure • The outcome of creation value • Experiences real-life practice • Social dimension, relationships with stakeholders • Iterative approach to problem-solving and prototyping	Case Study; Course Development, Survey with Students
2019	"Design Thinking pedagogy and enterprise education" *McLuskie, P.; Dewitt, S. (2019): European Conference on Innovation and Entrepreneurship*	The aim of this study is to extend understanding of Design Thinking pedagogy in the context of enterprise education.	Nexus is only sketched and synergies are described based on Six-Stage process; Ten Principles for Entrepreneurship Education, further the article refers back to the 9 elements identified by Huber et al. (2016).	Online Survey among Design Thinking Educators

2019	"University entrepreneurship education: a Design Thinking approach to learning" *Linton, G; Klinton, M. (2019: Journal of Innovation and Entrepreneurship*	The paper presents a method approach utilizing Design Thinking for entrepreneurship education. Design Thinking is used to redesign an Entrepreneurship Course (Entrepreneurship as a method)/ Design Thinking as a method to teach through entrepreneurship	Reoccurring themes (no model provided): • Co-creation of opportunities by using effectuation • Solving of wicked problems by an iterative process • Creative and innovative mindset • Experimentation and practices as central elements to Entrepreneurship Education and DT	Case Study / Pilot Course Design
2019	"Comparing effectuation to discovery-driven planning, prescriptive entrepreneurship, business planning, lean startup, and design thinking" *Mansoori, Y; Lackéus, M. (2019): Small Business Economics*	Comparison of Effectuation with five other entrepreneurial tools, including Design Thinking	Effectuation and Design Thinking match in the following conceptual dimensions: • Knowledge expansion: User Needs as starting point • Redirection of power by implementing iteration loops • Continuous learning through iteration and feedback • Iterative and non-linear process • Stakeholder-interaction is active • Embrace of team-based collaboration Emphasis on value-creation	Comparison based on Conceptual Dimensions
2019	"Design Thinking and Entrepreneurship Education: Where Are We, and What Are the Possibilities?" *Sarooghi, H., Sunny, S., Hornsby, J; Fernhaber, S., (2019): Journal of Small Business Management*	Sarooghi et al. "provide theoretical links to provide conceptual clarity to design-based entrepreneurship education, propose recommendations with a multistakeholder alignment-based model, and perform a survey to demonstrate its current state of practice" (p.78)	Focus on research on three main areas (all by survey): • Overall Design Thinking orientation of the entrepreneurship curriculum • Comparative emphasis on Design Thinking mindset, process and tools Infrastructure supporting Design Thinking	Conceptual (Opportunity design framework to facilitate Design Thinking in Entrepreneurship Education) Survey on the use of Design Thinking in Entrepreneurship Education

2019	"Design Thinking in entrepreneurship education: Understanding framing and placements of problems" *Tselepis, T.J. & Lavelle, C.A., 2020, Acta Commercii 20(1)*	Design Thinking as a framework to be used be entrepreneurship educators to frame problems within entrepreneurship education Understanding of design as a perspective	They identify three main themes linking entrepreneurship and design • The theme of transformation • The theme of novelty • The theme of innovation	Conceptual
2020	"Entrepreneurial ways of designing and designerly ways of entrepreneuring: Exploring the relationship between Design Thinking and effectuation theory" *Klenner, Gemser, G., & Karpen, I. O. (2022): The Journal of Product Innovation Managemen*	The study introduced the concepts on the "entrepreneurial ways of designing" and "designerly ways of entrepreneuring" exhibited by designer-founders. The research reveals the reciprocal relationship between Design Thinking and effectuation theory.	Identified themes and nexus described between Effectuation Principles and Design Thinking Practices: • Means orientation + Human-centredness • Strategic partnerships + Embracing diversity • Nonpredictive control + Visualization • Affordable Loss + Experimentation • Exploitation of contingencies + Reframing	Qualitative Interview Study with Australian Design-Founders

Appendix B – Coding Summary

Core Themes	Example of Sub-Codes and Themes
*Course Design (DTinEE)	Unconscious Explicit / Implicit DT approach DT integration DT use DT Course DT teaching ...
*DT Definition and Perspective	Process Perspective Mindset Perspective Tool Perspective Educational Tool Education Design Idea Development Creativity …
Role of the Educator	EE Perspective Teaching philosophy Educators mindset Facilitator Entrepreneurial Teaching Informal ...
Value of Design Thinking	Student perspective Value for the educator Value of Structure Value of Prototyping Value of Process Value of Communication Divergent Thinking ...
Criticism	Simplification Clash of Culture Only Creative Fear of Fad Conceptual Level Wrong Label ...

Appendix C

Form of DT integration	Description	Motivations and Value	Challenges and Criticism	Literature
Selective	Design Thinking is integrated in a selective and opportunistic way, often through use of single Tools/ Methods	DT provides hands-on methods to turn an idea into reality (prototyping) DT fullfills need for simple, interactive and fun tools	Perceived lack of theory Simplification and likeability Barriers of physical infrastructure (Prototyping)	Design Thinking is manifested in the practice of facilitating the process of innovation from a tool perspective (Brown, 2008; Liedtka, 2015).
Idea-Centric	Design Thinking is integrated in the (often project-based) Entrepreneurship Course to guide the process of idea generation in the beginning	DT fosters problem-understanding of students (wicked-problems) DT provides toolbox for ideation and supports divergent thinking	Limited applicability to e.g. tech-entrepreneurship Narrow focus on "human-centred" innovation	DT is useful in the begining of a practice-based innovation process (Klenner *et al*., 2021) or as a useful front end to the new approaches to entrepreneurship (Glen *et al.,* 2014).
Procedural	Design Thinking Process is used to structure the Entrepreneurship Course based on the DT process	DT provides structure for messy processes DT process for self-directed learning	Over-Relying on process steps Non-iterative, step-by-step approach	Teach entrepreneurship as a method instead of a process (Neck and Greene, 2011).
Holistic	Design Thinking is used as overarching guiding principles for the teaching approach and intuitive use of tools or process elements on a principal basis	DT fulfills need for educational guidance and overarching principles DT provides semantic toolbox to communicate	Vacuum of educational guidance Concerns on superficiality and replacement of EE with trending approaches	A 'designerly' way of teaching entrepreneurship as reflected in Klenner *et al.,* (2021), Neck & Green, (2011) and Nielsen & Stovang, (2015) or as a 'teaching approach' for EE (Lynch *et al*., 2021).