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Design thinking in hospitality education: Lessons learned and future opportunities

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ABSTRACT

The current study explores to what extent design thinking supports students in hospitality education to develop higher-order thinking skills. A survey and student portfolios were used to gain insight into students' thinking skills. Findings demonstrated that industry partners were more satisfied with the students' thinking and innovation skills than facilitators (educators). In addition, findings showed a variation in students' higher-order thinking skills depending on students' prior education and/or experiences in the hospitality industry. The study suggests that a holistic and integrative approach to design thinking in the hospitality educational curriculum is needed to support the development of higher-order skills.

1. Introduction

The past few years have been challenging for the hospitality industry. The Covid-19 pandemic has shown that the industry is vulnerable and that responding to unprecedented, global, complex and continuous changes is an indispensable skill for hospitality professionals (Bhusan, 2019; Sigala, 2020). Hospitality professionals are required to possess higher-order thinking skills to construct meaningful ideas for these changes. Professionals need openness to new ideas and innovations and other skills such as tolerance for change, adaptability, flexibility, communication, problem solving, creativity and critical thinking (Bhusan, 2019; Iguchi, 2022; Suh et al., 2012; Wagner, 2014). In addition, based on the findings of Love (2020), Iguchi (2022) suggests that hospitality managers should be able to make analytical and (evidence-)informed decisions based on factual and credible sources, collaborate with others, design new practices in co-creation with others, and take time to reflect on the decisions taken.

Hospitality education has a crucial role in supporting students to develop these higher-order thinking skills. The hospitality industry also plays a pivotal role in the students' learning process. The industry needs to be connected to education, which gives students the opportunity to put theory into practice (Wrigley & Straker, 2017). It is believed that Design Thinking (DT) supports students to prepare themselves as innovative and creative professionals, who are able to anticipate current and future challenges. Higher-order thinking skills are needed to adapt to the rapid changes in the industry, however the literature about hospitality education seems hardly to deal with this topic. Therefore, the current study has an exploratory nature to identify the impact of DT on the students' development of higher-order skills.

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2. Literature review

This section reviews the relatively limited literature to date on higher-order thinking skills, DT, on its application in the hospitality industry, and how it is being used in hospitality education.

2.1. Higher-order thinking skills

Higher-order thinking skills are skills that support the students to link knowledge in a meaningful way, to identify suitable solutions to (business) challenges and act effectively in the changing world. The higher-order thinking skills are the essential skills such as problem-solving skills, critical thinking skills, and meta-cognitive competences (Miri et al., 2007). Meta-cognitive competences refer to thinking about one's own thinking and are defined as higher-order thinking skills (Brown, 1987; Valcke, 2010). Previous research demonstrated that higher-order thinking skills support students to increase their innovative skills, motivation, and "confidence in becoming changemakers and responsible professionals" (Phi & Clausen, 2021, p. 8). The higher the thinking skills are, the deeper the learning is. Lafley and Groves (2013, p. 227) argue that students are engaged in the deep learning if they meet some of the following criteria.

- Connecting facts, ideas and concepts in order to interpret, propose or judge.
- Processing new elements of information.
- Creating new information.
- Proposing one or more solutions in terms of judgement.
- Assuming advantages/disadvantages for a situation or solution.
- Presenting support or proof for support by examples.
- Judging supported by justification.
- Handling a problem from a wider perspective.

2.2. Design thinking

Existing thinking models seem less appropriate for the current challenges the industry faces, and seem to promote subject matter and decision-making processes that seek fast solutions rather than design attitudes that develop new ideas, choices and products (Bhusan, 2019). These so-called solution-oriented models often involve a linear process of operational sequences rather than iterative processes of relationships between various disciplines. Meaning-oriented models, in contrast, are a sustainable way to develop new ideas and make new choices for current challenges (Bhusan, 2019). Design Thinking (DT) is an example of such a meaning-oriented approach to problem solving. DT refers to a way of working and thinking which is human-centered, user-centered, innovation- and creative-oriented, and practice-and future-oriented (Lub et al., 2016). An important aspect of DT is the focus on the user perspective when developing new ideas, solutions or alternatives (Lor, 2017). Using DT means not focusing just on customer demands, but on complex human needs (Lub et al., 2016). In other words, DT is an iterative and integrative approach, which stimulates the exploration of holistic ideas and developments involving various disciplines and departments (Retna, 2016).

Design Thinking (DT) enhances students' creative thinking, problem-solving, collaborative, and communication skills and supports students to develop empathy and meta-cognitive skills (Retna, 2016; Sándorová et al., 2020; Scheer et al., 2012). DT has a long tradition in the technical and creative sectors. In education, DT is increasingly adopted across different domains globally. This reflects a trend as DT is increasingly seen as an important and generic skill (Van Diggelen, 2021). In addition to being an important and generic skill, design thinking refers to a specific mindset and an approach for providing innovative solutions (Den Dekker, 2020). DT is also about pushing students out of their comfort zone and urging them to deal with uncertainty, insecurity and ambiguity (Lynch et al., 2021).

However, there is no consensus in the literature about how to define design thinking. Nevertheless, some scholars have attempted to provide an overview of characteristics of design thinking approaches (Micheli et al., 2018). Studying the work of major scholars on design thinking, it appears DT approaches possess the following characteristics: empathy, using perspectives of different stakeholders, interdisciplinary collaboration, diverging and converging, framing and reframing by abduction, iterative design and experimentation, visualization, tolerance for ambiguity, and learning from making mistakes. Looking at these characteristics it becomes clear that DT involves many more complex and higher-order thinking skills than merely applying the DT steps (Van Merrienboer & Kirschner, 2018).

In the literature various DT phases or steps are distinguished. In general, the three stages of Brown and Katz (2011) include all these phases or steps. According to them, DT consists of three stages: inspiration, ideation, and implementation. In the inspiration stage empathy is crucial. The aim of this stage is to obtain deep insights into the design challenge by exploring the problem, understanding the users and conducting research. In the ideation stage, collaborative sense-making takes place by generating ideas and exploring opportunities by iterative processes in which prototyping, experimenting and feedback from users are key elements. In the last stage, the implementation phase, implementation teams are formed, and business resources and models are determined. In this phase prototyping and piloting of the design takes place. Evaluation and reflection are crucial. As Bhusan (2019) emphasized, designing is a reflective conversation, "the concept is that design talks to the problem and the problem talks back" (p. 450).

2.3. Design thinking in the hospitality industry

DT is very important for the hospitality industry. The many changes in society, technology, and the economy and how we work and live, mean that 'global citizens' are searching for "authentic living and travel experiences" (Lub et al., 2016, p. 250). One of the few examples of the use of DT in the hospitality industry can be found in the work of Lub et al. (2016), who created a new concept of the 'Lifestyle Hub' in which design thinking principles are used. They argue that scenario building and design thinking have much in common as they are both future-oriented. While deductive thinking is based on what 'should be' and inductive thinking is based on what 'is', they argue that a third approach of 'abductive logic' is needed to focus on 'the logic of what might be' (Lub et al., 2016, p. 251). The link between DT and abductive reasoning has been confirmed by other scholars as well (Van Diggelen, 2021). In their research Lub et al. (2016) suggest that design thinking is focused on the meaning of products or services and how that meaning can add value to people. Regarding the Lifestyle Hub, they investigate "a future of the hotel as an integrated space in constant evolution that serves highly dynamic lifestyles of tomorrow" (Lub et al., 2016, p. 259). In the hub, the process of doing trend analysis, empathising with the end-user, creating personas and developing a prototype takes place. As a result, a prototype can be developed, one that may not necessarily be a finished physical product, but one that can serve as an inspiration for hospitality developers. It seems that developing a prototype as an inspiration, however does not always lead to ideation and implementation as described by Brown and Katz (2011). As a result, it may not reflect the higher-order thinking skills.

2.4. Design thinking in hospitality education

DT was originally used in architecture and engineering educational programmes. The Stanford University School in California and the Hasso Plattner Institute of Design in Potsdam (Germany) were amongst the first educational institutes who used DT in their educational programs. Nowadays other educational programmes such as business and management educational programmes also recognize the impact of the DT approach on teaching and learning (Panke, 2019; Retna, 2016). Educational programmes developed and implemented the DT pedagogical approach to teaching and learning in various ways. MellesHoward and Thompson-Whiteside, 2012, p. 162) distinguish four types of implementations: 1) as a design method in one of the courses of the university; 2) as a design method within a course of a programme unit; 3) as a learning goal within individual seminars/lectures, or 4) as a general philosophy of the whole curriculum. In addition, based on an extensive literature review, Panke (2019, p. 295), concluded that "DT in formal settings also appears as a curriculum design technique, as a facilitation technique in student support, as a method for process improvement or product development and as an approach for leadership and organizational development".

DT can be seen as a human-centered, iterative, problem-solving process carried out in collaboration with students, educators and industry partners (Mahato et al., 2021). The trialogical process between these three stakeholders is one of the features of DT (Geitz & de Geus, 2019). Educators and industry partners support students to apply DT. They are partners in learning, and support students to develop higher-order thinking skills (Van Merrienboer & Kirschner, 2018). Critical thinking reasoning, researching, questioning, observing, analysing, exploring, evaluation and reflecting are examples of such higher order thinking skills (Barahal, 2008). Moreover, showing higher-order thinking skills indicates that participants make sense of and are able to transfer the acquired knowledge and skills to other and new situations (Anderson et al., 2001), and this is an essential skill for a graduate.

Previous research demonstrated that there are, in addition to the aforementioned benefits of DT, also a number of challenges in implementing DT in higher education. One of the challenges is that the approach to teaching and learning differs from conventional educational programmes (Brown & Wyatt, 2010). Educators need to take on a supportive facilitator role and should be able to use various facilitation strategies to support students' self-directed, collaborative (Assen, 2018) and design thinking processes (Van Diggelen, 2021). Educators seem to be uncertain about their role in innovative, educational concepts such as DT (Assen, 2018; Henriksen et al., 2018). Coaching students while working on open-ended design challenges is seen as a complex skill by many educators (Assen, 2018; Van Diggelen et al., 2021). Other challenges are fostering students' creative and teamwork skills. Panke (2019) suggests that a lack of students' creativity skills might lead to rather conventional solutions to design challenges. Moreover, working in teams on open-ended issues can be an emotional process (Van Diggelen et al., 2021). Students often face teamwork conflicts during DT processes, resulting in anxiety and frustration (Panke, 2019). In addition, Retna (2016) emphasizes that inadequate resources, time constraints and the misalignment between learning outcomes and design thinking processes may have an impact on the collaborative and innovative learning processes.

2.5. Present study

As more universities in The Netherlands adopt Design Thinking, it is crucial to explore students' experiences with DT in hospitality education and to explore whether students indeed develop higher-order thinking skills by using this approach to teaching and learning. In this exploratory journey the hospitality industry is one of the main stakeholders in the students' experiences with DT. In addition, facilitators are supporting students' learning processes. Therefore, the aim of the current research is to obtain insight into facilitators' and hospitality industry partners' perceptions regarding student learning processes and to explore to what extent DT supports students to develop higher-order thinking skills, leading to the question: "What lessons are learned and what are the opportunities?".

3. Methodology

3.1. Context

The University of Applied Sciences involved in this study adopted Design Based Education (DBE) as an approach to teaching and learning in 2018. The motivation of the university for this change is to educate students to become professionals who can work with others to find solutions for complex problems, who are people-oriented, environmentally oriented, ask the right questions, who can think 'outside the box', are not afraid to experiment, and develop unexpected perspectives and possible solutions. The trialogical process between students, educators and industry partners is a key element in DBE. Referring to the types proposed by Melles et al. (2012), the university has chosen for a general philosophy for the whole curriculum across all the university programmes. The university identified five facets of DBE. The five facets are personal leadership, multidisciplinary collaboration, international/intercultural, design thinking and sustainable education. The Hotel Management School (HMS) is one of the programmes offered by this university. The ambition of HMS is to support and challenge students to develop themselves as, 'world-wise citizens' and 'game changers', who are self-aware and become the ingenious, agile, responsible and learning professionals of the future.

The current study focuses on the facet of Design Thinking (DT) within DBE. DBE offers students the opportunity to develop higher-order thinking skills by designing solutions for complex, multi-disciplinary, real-life issues (design challenges) derived from the hospitality industry. Students design ideas for the real-life issue in dialogue with others (students, educators and industry partners). Six iterative DBE phases, based on DT phases, are distinguished to support students to develop meaningful prototypes for the design challenges: Explore/research the real-life issue, define the core question based on knowledge and from a user-perspective, generate ideas, design or create a prototype, apply and test the prototype, research the effects, reflect and improve when needed.

Third year HMS students (in groups of 3–5) work collaboratively in ateliers for 15 weeks (meeting 2 times for 3 h each week). The atelier is a learning and work environment in which students (learn to) work on design challenges derived from the industry. They are supported by a facilitator, experts (educators) and industry partners. The most important task of the facilitator is to observe and to activate students' research, learning and design thinking processes by using various facilitation strategies. Experts share their knowledge and experiences when needed, in a just-in-time and tailor-made format, related to the design challenge. The industry partners provide information and knowledge needed for the development of the design challenge and provide feedback on the designed prototypes.

The design challenges are linked to a specific set of learning outcomes. Students who work on design challenges are responsible for collecting evidence to demonstrate that they have mastered the learning outcomes. Working on a design challenge is one of the activities which can be used to collect evidence. To develop the necessary knowledge, skills, attitudes and values, and to successfully produce the professional products, expert sessions are organized in the form of workshops, consultancy sessions, lectures or other sessions. These are supported by valuable information and study material on the Blackboard virtual learning environment. Students demonstrate the evidence on learning outcomes and reflect on feedback received on their design and learning processes in their individual portfolios. At the end of the semester, the students digitally submit their individual portfolios which consist of professional products and a reflection on each learning outcome based on the evidence provided.

3.2. Participants

To obtain insight into the facilitators' and industry partners' perceptions of students' learning all involved facilitators and industry professionals were invited to participate in the current research: 13 out of 30 facilitators and 45 out of 80 industry partners completed the survey.

To explore to what extent students developed higher-order thinking skills, the professional products and reflection reports in the digital portfolios of eight third year HMS student groups (three students per group, in total 24 students) were included. The students belong to different tracks, mainly regular track, fast-track and short-track streams. Regular track students who follow a four-year programme and fast track and short-track students who follow a three-year programme. Fast-track are students from pre-university education and short-track students are students who received exemptions based on their hospitality experiences and prior

Table 1
Overview of design challenges and students' characteristics.

Characteristics	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	Group 8
Design Challenge End product	Advisory report	Advisory Report	Advisory report	Advisory report	Advisory Report	Marketing Plan	Marketing & communication strategy	Marketing & communication strategy
Company type	Profit	Profit	Profit	Non-profit	Non-profit	Non-profit	Non-profit	Profit
Company location	France	Lebanon	Philippines	Netherlands	Mali	Australia	Netherlands	Netherlands
Students Stream	Short track	Regular	Regular	Regular	Regular	Regular	Regular	Fast Track
Composition of the group	International EU and non Eu	International EU and non EU	Dutch	Dutch	Dutch Non EU	Dutch EU	Dutch	International EU and non EU

knowledge. In Table 1 the characteristics of the design challenges and students are provided. The regular students are mostly aged between 19 and 20, whereas the fast-track and short-track students are aged between 22 and 28. All students will graduate with a four-year Bachelor's Degree. These students started with DBE in September 2021.

Most of these students had no previous experience with DBE. They had previously experienced the Problem-Based Learning approach to teaching and learning in year one and two of their education. During the semester students focused on global strategic management. Students were asked to demonstrate their ability to analyse a business in a methodical manner using consultancy and marketing/communication reports, and based on this analysis take evidence-informed decisions that have an impact in the short, medium and long term. The goal of the assignment was to develop an improvement and/or innovation at a strategic level for a design challenge offered by industry partners. Students show their learning and development in reflection reports which are a part of their portfolio.

The students' portfolios were selected based on the characteristics of students and of the design challenge they worked on. The following student groups are involved.

3.3. Data collection and analysis

3.3.1. Survey: perceptions of facilitators and hospitality industry partners

The survey was developed by researchers and coordinators of the educational programme and was divided in four sections: preparation/communication (2 items); student learning process (4 items); collaboration with and the role of industry partners (2 items) and design improvement/innovation (2 items). In Table 2 examples of survey questions are shown.

A five-point Likert scale was used. Means and standard deviations of both groups were calculated and differences in perceptions were analysed by applying independent sample t-tests.

3.3.2. Students' reports: students' design thinking level

The students' design thinking level skills were analysed by using The Educational Ladder, developed by Wrigley and Straker (2017). The Educational Ladder is based on the Danish Design Ladder developed by the Danish Design Centre (Kretzchmar, 2003) and on the constructive alignment of key curriculum elements, objectives, teaching and learning activities, and assessment tasks identified by Biggs (1996). The Educational Ladder provides insight into the pedagogical steps of Design Thinking, from low-order skills to higher-order thinking skills. The aim of the ladder is to support students in moving from step 1 to step 5, from foundational level to professional, personal and leadership level.

The Educational Ladder consists of the following levels, and each level also includes the previous level.

1. Foundation Level: focus on factual knowledge comprehension, knowledge terminology, specific details and elements and interpreting, explaining and identifying.
2. Product Level: focus on conceptual applications, knowledge of classifications and categories and principles and implementing, executing and translating.
3. Project Level: focus on conceptual analysis and de-constructing, differentiating and organizing.
4. Business Level: focus on procedural synthesis, knowledge of specific skills, techniques and methods and coordinating, critical thinking and testing.
5. Professional Level: focus on meta-cognitive evaluation and reflection, strategic knowledge of cognitive and personal development and appraising, valuing and selecting.

Two researchers, both HMS staff, analysed the students' level of thinking in reflection reports in the portfolios (Wrigley & Straker, 2017). The level of the first three criteria were determined by using the group reports and the last criteria (learning processes) was determined by using individual reflection reports.

- Type of knowledge required for the design challenge
- Taxonomy level of cognitive skills
- Key verbs and activities applied in the practical context
- Learning process (individual evaluation and reflection on learning process)

Table 2
Examples items.

Section	Facilitators	Hospitality industry partner
Preparation/communication	The information provided by HMS about working in DBE was clear	The information provided by HMS about working in DBE was clear
Student learning process	Students were able to manage and lead their own project group while working on the design challenge	Students were able to manage and lead their own project group while working on the design challenge
Collaboration with and the role of industry partner	The knowledge and experiences of the industry partner was essential to support students during the learning process	My knowledge was essential to support students during the learning process
Improvement/innovation	The students designed a well-founded and specific solution for the design challenge which is valuable for the company	The students designed a well-founded and specific solution for the design challenge which is valuable for our company

The portfolio reports were analysed in a three-step approach. In the first step, the reports were divided into episodes in which students reflected on their thinking skills. In the second step, episodes were coded, using the Educational Ladder. Per episode the type of knowledge, taxonomy level of cognitive skills, verbs used in the reflection and the way the description of individual learning process, were determined. Based on these criteria the students' portfolios were related to one of the levels of the educational ladder. To ensure data accuracy, both researchers analysed the reports individually and then compared and discussed their findings. In all cases the two researchers had common consensus on the findings.

4. Findings and discussion

4.1. Perceptions of facilitators and industry partners

The facilitator and industry partner perceptions of DT in HMS are shown in Table 3.

As shown in Table 3 industry partners score significantly higher than facilitators, on all four factors. This indicates that industry partners are more satisfied about the students' (design) learning process than the facilitators.

Facilitators score the highest on the collaboration with industry partners (M = 3.08, SD = 1.15) and the lowest on improvement/innovation (M = 2.54, SD = 0.90). More specifically, in their own role facilitators score highest on feeling confident in providing students with feedback (M = 3.46, SD = 1.13) and they were most critical about the knowledge building of students while they work on the design challenge (M = 1.69, SD = 0.63). The industry partners score the highest on supporting students with necessary inputs and experiences and supporting students' design thinking processes as positive (M = 4.11, SD = 0.61) and lowest on the improvement and innovation for the design challenge (M = 3.53, SD = 1.02). More specifically, the industry partners score the highest on their own role as company supervisor which allowed them to provide students with necessary input (M = 4.22, SD = . 70) and the lowest score on to what extent the contact with the facilitator contributed towards further exploration of the design challenges (M = 3.40, SD = 1.25).

An explanation for the gap between facilitators and industry partners might be that facilitators, as representatives of HMS, are responsible for students' development of learning processes/outcomes and that industry partners are more focused on the design of the product/service. Therefore, it might be that facilitators are more knowledgeable about and critical of students' learning outcomes and behaviour during the development of solution for the design challenge. Besides, for the hospitality industry partners it is valuable that the designed solution for the real-life issue is practical and can be implemented. It is important to keep in mind that there might be a difference between the focus on student learning processes of industry and education and this might lead to various perspectives on the role of the industry in hospitality education. A debate around hospitality education and industry is not new (Airey & Tribe, 2000; Lashley, 2004; Morrison & O'Mahoney, 2003; Taylor & Edgar, 1996), nor is the fear that what is taught in further and higher education is not relevant or current enough for industry and societal needs. Scholars have long used such words as 'crossroads', 'encouraging creativity', and 'industry needs' (Ferguson & Berger, 1985; Goodman & Sprague, 1991; Lewis, 1982). At the end of the last century there were concerns about the relevance of internships (Petrillose & Montgomery, 1998) and the curriculum (Lefever & Withiam, 1998). At the same time others were writing about the need for hospitality courses to keep up to date with technology (Sigala & Baum, 2003), but also warning that hospitality education has a responsibility to 'lead' the industry rather than follow it and those academic courses should not be subjected to a 'tyranny of relevance' (Taylor & Edgar, 1996, p. 222), a point also made by Lashley (2004) and Airey and Tribe (2000). They express their concerns about the focus on 'vocational action' in hospitality higher education.

Another explanation of the gap between the perception of facilitators and industry partners might be that students and facilitators engaged in DT for the first time. Organizational processes were not fully ready for the implementation and not all facilitators were well-prepared to guide DT processes, therefore facilitators may have experienced some confusion and frustration, which might have impact on students' performance and facilitator and industry perceptions.

4.2. DT level per group

The level of thinking skills was determined using the following themes: type of knowledge, taxonomy level, key verbs and activities and learning process, related to the Educational Ladder (Wrigley & Straker, 2017).

The findings showed a variation in design thinking levels. In general, fast and short track students demonstrated a higher level of design thinking skills than regular track students. This was across all four criteria. Overall, fast track students demonstrated DT skills in their portfolios between business and professional level, short track students between product and business level and regular students between product and business level. Portfolios of fast-track students demonstrated that they focus on meta-cognitive reflection skills, short track on procedural reflection skills and regular students on conceptual reflection skills.

Business, marketing and consultancy reports were generally well written and showed that students were capable of describing and

Table 3
Comparison between facilitators (n = 13) and industry partners (n = 45).

	Facilitators	Industry Partners	T	df	p
Communication/preparation	2.85	3.78	−3.570	56	.001
Student learning processes	2.79	3.84	−3.869	56	.000
Collaboration industry	3.08	4.11	−3.113	56	.008
Improvement/innovation	2.54	3.53	−3.162	56	.003

Table 4
Level of DT per criteria.

Level	Fast track students 1 group 3 students	Short track students 1 group 3 students	Regular students 6 groups 18 students
Type of knowledge	4	3–4	3
Taxonomy level	5	4–5	2- 3 - 4
Key verbs and activities	5	4–5	2- 3 - 4
Learning process	4–5	3–4	2- 3 - 4

explaining the problem, implement various ideas and methods and were able to place theory into practice, as illustrated in the following example.

4.2.1. Example: level 2

> "*In this assignment we needed to come up with an investment for …... We first started with making a SWOT & TOWS analysis then possible risks were carried out. The plan we came up with was … to promote more brand awareness and revenue, of course we will face risks*".

In this example the student describes what they did and explained the idea for the design challenge, without describing the underlying learning process. The focus is on the application.

Students designed creative and innovative prototypes, however regular students tended to focus on the practical application and the other students showed that they were capable of seeing a broader context. It was interesting that the iterative process of DBE was rarely mentioned in the student portfolios. Although they received feedback from facilitators and industry partners, it is not clear how they integrated this into the iterative process of design thinking. Most students were able to identify key elements of the design challenges, and to analyse, measure, and relate these key elements to one another. Some students demonstrated skills such as creating new approaches and integrating these approaches in new procedures, as illustrated in the following examples of DT level 3 and 4.

4.2.2. Example: Level 3

> *"Based on the annual report of the company, the probability and impact of different kind of risks have been listed. The risks were divided between strategic, operational, financial, and compliance risks. They are shortly explained and the probability and impact of it was estimated. To give a clear overview, all the information was combined in a risk management model. What would have been better is that we developed more in-depth actions that minimize the risks. Some ideas were mentioned, but these could have been more extensive. I had not delved into this topic before, I found it interesting to find the deeper meaning of risks and especially the impact that they can have. It made me realize that every company will always have risks and one can only prevent them until a certain level"*

In this example the student describes what the group did and which risks they have taken into account, and how they used certain methods. They explained the value for the company. Moreover, they identified and analysed what they could have done better. The focus is on analysis.

4.2.3. Example: Level 4

> "*I learnt that for a proper risk analysis it is crucial to follow some steps. The first step is risk identification. I had to conduct proper research on what kind of risks there are and which risks are applicable to analyze. The next step involved an evaluation process. I was able to detect the likelihood of occurrence by applying the risk and impact assessment matrix. Allowing to grade the risks … ….. Thirdly, a risk mitigation takes place. This process requires to develop a plan that reduces the impact of an unexpected event. Once all steps were handled, it is most critical to monitor and review the analysis and risks. In this specific case of …., the operational risk must have been closely monitored. Proper communication afterwards is very important to ensure that undetected risks are shared and adjusted"*

In this example the student describes the risk analysis. The student describes the process and what the impact was on the learning process. In addition, the student is able to integrate the knowledge in the recommendations to the company. Strategic options and plans are presented. The focus is on synthesis.

In this study fast and short track students were more able to bring it to a conceptual and procedural level. They were capable of interpreting organizational principles, constructions and relationships. They identified processes and recognized values and effects of decisions taken by the company. They analysed the company using various methods and tools and focused on new product design and discovered various opportunities. Fast-track students showed that they were aware of and recognized when they used their personal and professional skills, and they were able to explain their learning process. Moreover, fast track students demonstrated the development of in-depth unique structures, models, and showed higher level of creative thinking, which indicates that they were moving to a meta-cognitive, professional level, as illustrated in the following example (level 5).

4.2.4. Example Level 5

> "*While working on the design challenge, my group and I had to detect critical risks that could harm our project deliverable. Based on the risk analysis we were able to draw strategic decisions throughout the process. We decided that planning is essential from the beginning on. Moreover, we discovered through the risk analysis that our problem statement was too ambiguous. Therefore, we established research. I noticed that the group was more confident. Involving the stakeholders' opinion seemed to be one of most important steps in forming valuable strategic decisions. I learnt that in order to achieve high level outcomes as a manager, a helicopter view, planned and structured strategic plans and good communication are critical*"

The student describes the learning process from a metacognitive level. The student explains why certain methods are crucial and recognized the importance of developing research skills. The student is able to review and assess the learning process and justifies the steps taken to improve the process. Moreover, the student is able to evaluate the personal and professional development. The focus is on evaluation and reflection.

4.3. Variation of DT levels explained

The individual evaluation and reflection level of students differed per group member. Some students struggled more with reflection skills than others. It seemed that most students from the regular track have more difficulties with reflection than students from Fast Track and Short Track. Differences in level of thinking and reflections skills were also shown within groups. Students with the same design challenge showed different evaluation and reflection skills and this is an interesting topic for further research.

The differences in design thinking levels were mainly seen in the individual reflection reports. Some students found it challenging to connect facts and concepts in order to interpret and reflect on their deep learning, and to handle a problem from a wider perspective (Leflay & Groves, 2013). In addition, they also found it more challenging to incorporate what was discussed during their collaborative group work, what they have learned and what it means for their learning process, than others. Some students found it easier to reflect on their learning process than others. These findings suggest that students have difficulties with observing their learning process from a helicopter view, a skill which is important for lifelong learning for graduates.

A possible explanation for the variation in thinking levels between regular and other students might be that most of the short and fast track students are older than the regular students, that fast-track students developed higher-order thinking skills during their pre-university education, and that short-track students applied these skills and gained knowledge during their previous job experience in the hospitality industry. Therefore, they seem more able to deal with ambiguity and uncertainty and cope with situations outside their comfort zone (Lynch et al., 2021).

The differences in DT levels could also be explained by other factors, such as the nature of the design challenges students have been working on and the involvement of the facilitators and experts. For example, a real-life, multi-disciplinary, structured design challenge which requires students to direct their own learning, to learn collaboratively in multi-disciplinary teams, to build knowledge using prior knowledge and external sources, and to reflect on their learning process, stimulates the development of higher-order skills (Assen, 2018; Gomez-Puente et al., 2013). It is likely that the opportunity to get access to necessary data (such as annual plans, evaluations, etc.), to get in contact with users (Lub et al., 2016) and that good contact with the industry partner influences the level of DT skills. The distance and cultural differences between the organisation and the students may also have an impact on communication and preparation, and therefore on the way students are capable of analyzing the design challenges. It seemed that communication was more difficult when the company was outside the Netherlands (Australia, Mali, etc.) and when cultural differences played a role. It may be that they lead to misunderstandings between the stakeholders, although this in itself could also be a valuable learning experience for graduates.

In line with the findings by Assen (2018) and Henriksen et al. (2018) the current study suggest that the involvement of facilitators and experts is crucial for achieving higher levels of DT. The impression of the researchers was that students mirror the experts' and facilitators' way of thinking in designing the prototype. There is some evidence to suggest that expert and facilitator feedback strongly influenced the models and strategies students applied in the design. For example, the SWOT analysis approach was explained by the experts. Most groups used a SWOT analysis to evaluate the company, however almost none of them compared the SWOT tool with other analysis methods or explained why they chose the SWOT analysis for their design challenge.

4.4. Limitations and future opportunities

The findings of the current study are subject to a number of limitations. Firstly, for students as well as for facilitators, DBE was a new approach to teaching and learning. They had previously used a Problem Based Learning (PBL) approach in their studies. Moreover, these students did not receive an 'onboarding' programme. They had to rely on the facilitators' limited knowledge and experience with DBE. The development of DBE understanding and skills results from "learning-by-doing" and on-the-job training. In addition, it was the first time that students used a portfolio to prove their development and achievement of the learning outcomes. Students did receive training about how to write a reflection report, but reflection and evaluation of their learning processes was also new for them. This may have led to confusion, frustration, dissatisfaction and teamwork conflicts for students as well for facilitators (Glen et al., 2015; Panke, 2019). Observations of atelier sessions was out of the scope of the current study; therefore, it is not clear which deep-approach questions to encourage the iterative learning process and the development of reflection skills were asked by facilitators during the atelier sessions. Did they focus on reflection? How were students supported to develop their portfolio? Further

research into the role of students and facilitators (and also industry partners) in DBE would be of great help in the DBE development and implementation process.

Secondly, a detailed description of the participant characteristics such as age, social and economic status, intelligence, education and industry experiences are not included (although they were all in full-time hospitality higher education). These characteristics might have impact on the higher-order thinking skills and therefore it is recommended to include these in further research.

Thirdly, the nature of the design challenges influenced the students' learning process. Some of the design challenges had a multi-disciplinary focus while others did not, and some had been formulated in an open-ended way whereas others had not. Consequently, these design challenges perhaps did not encourage students to develop higher-order thinking skills. Moreover, contact with the hospitality industry is pivotal for the design thinking process. It is recommended to explore the impact of design challenges and to set up, together with industry partners, clearer criteria for design challenges. Instead of approaching hospitality professionals as clients, an approach as partners and co-creators in learning might change the focus on solutions for products to students' learning processes/outcomes (Van Merrienboer & Kirschner, 2018). This will truly and fundamentally stimulate the trialogical process, between students, educators and industry (Geitz & de Geus, 2019).

4.5. Conclusions

The current study explored the initial experiences of a hotel management school in using design thinking and design-based educational concepts. It showed that there is some discrepancy between the perception of industry partners and facilitators. Industry partners were more satisfied with student learning and communication and innovation skills than the facilitators. An explanation for this might be that facilitators are focused on the development of learning processes and achievement of learning outcomes, which are formulated by the educational institution, and industry partners who are focused on the application and implementation of the designed product/service.

Facilitators' perceptions seem to be in line with the findings of the portfolio analysis carried out for this study. The analysis demonstrated that although design thinking supports students to develop higher-order thinking skills, not all students were demonstrating these skills. Mansvelder-Longayroux et al. (2007) distinguished between action-oriented and meaning-oriented reflection. The current study shows a level of reflection in between these two, referred to as learning-oriented reflection. In line with Mansvelder-Longayroux et al. (2007), reflections shown in portfolios were predominantly action-oriented. Students describe what has been done, what they know and which methods and tools they used. So, compared with the Education Ladder, they perform at level 1 or 2 (on a foundation and product level). Some reflections were learning-oriented (what they learned, analysing the learning process and results), comparable with level 3 and 4, and a few descriptions were meaning-oriented description (sense-making and aware of the underlying principles), comparable with level 5. This indicates that most students performed at a conceptual level, some on a procedural and a few on a meta-cognitive level. This last group of students were critical of themselves in terms of performance and the level of competences achieved. They were able to reflect on their personal and professional learning processes and showed they were capable of making sense of what they learned. This is pivotal to help students to develop reflection skills for lifelong learning. Prior education and hospitality experiences seem to influence the level of DT skills. Fast Track and Short Track students were more capable of performing at procedural and metacognitive level skills than regular students. Most portfolios of regular students showed a lack of in-depth reflection on learning experiences.

To develop and implement DT, an integrative DT approach to teaching and learning is needed, (Tschimmel & Santos, 2018). The implementation of DT as one of the courses or as a learning goal within a course (Melles et al., 2012) makes it difficult for the stakeholders to deal with the various teaching and learning environments (Assen et al., 2016). It is preferable to implement DT as a general philosophy of the whole curriculum (Melles et al., 2012). Therefore, to support students to develop higher-order skills, an integrative approach to DT is crucial, in which the role of the stakeholders (students, educators and industry partners) as well as curriculum development (wicked problems, multi-disciplinary assessment), and organizational structure, are aligned (Retna, 2016). Hospitality education should be aware that DT requires a holistic approach to teaching and learning and for an integrated approach to educational development (Assen, 2018).

Author statement

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