

Personalised Creativity Development through Design Thinking

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ABSTRACT

Developing creativity in higher education can be challenging because of the differences in students' personality- and cognitive traits, creative competence and learning preferences. This pilot study presents a novel prototype of a pedagogical model that integrates principles of design thinking and personalised learning to cultivate creative confidence within a pedagogical setting in higher education. The model is based on a multi-level theoretical framework comprising pedagogy of creativity from micro- and macro level consisting of literature on creativity, creative confidence, how creativity can be practiced, creative diversity, personalised learning as well as design thinking and its educational applications. A quasi-experiment of the pedagogical intervention explores how the students experienced and perceived the outcomes of each step of the design thinking process when applied to their personal creative development. It also investigates in which ways the empirical data collected from the intervention align with the core constructs of the proposed model for personalised creativity development. The data is analysed through directed content analysis. The results suggest that design thinking offers a structured approach for supporting cognitive processes of creativity as well as interaction with the surrounding system to increase creative confidence. The main contribution of the experiment is the new hypotheses for further research around the topical issues of design thinking's pedagogical applications and personalised creativity development.

Keywords: Creativity education; creative confidence; design thinking.

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INTRODUCTION

Creativity is one of the reasons *Homo sapiens* has survived till today (Zwir et al., 2022). In the context of education, creativity is recognised as a crucial ability for dealing with uncertain and complex working life and contemporary social challenges, hence fostering creativity has become a core goal across all levels of education (De Alencar et al., 2017; Álvarez-Huerta et al., 2022), including higher education. Creativity is also understood as one of the crucial work-life skills to complement technology-related skills in the fifth industrial revolution when moving towards 2030 (Poláková et al., 2023; World Economic Forum, 2025). It is also fundamental feature of the renewal and competitive advantage of economies (Schumpeter, 1934).

Despite this, several factors hamper implementing creativity in higher education, such as students' resistance, organizational structure, faculty attributes and pedagogical practices (De Alencar et al., 2017). To engage more students into creativity, personalised approaches taking into account different personality- and cognitive traits, varying creative competence and learning preferences are needed. Structured pedagogical methods which enable personalisation are currently limited to technical solutions such as those by JongHo & Kim (2010) and Lin et al. (2013) and lack a systemic-level approach to creativity.

This study presents a novel prototype of a pedagogical model and intervention aiming to develop university students' creative confidence by designing personal creative strategies. The strategies are formed and tested through a personalised learning process built on a five-step design thinking process.

The research questions (RQ) are:

- (RQ1) What kind of model would apply for personalised creativity development?
- (RQ2) How do students experience and perceive the outcomes of each step of the design thinking process when applied to their personal creative development?
- (RQ3) How do the students' reflective accounts align with the core constructs of the model?

The theoretical background of this research forms a basis for the prototype of the personalised creativity development model (RQ1). The model can also be considered to be a hypothesis, which is tested empirically. The model is turned into a pedagogical intervention to collect empirical data, which is analysed to answer the second (RQ2) and third (RQ3) research questions.

THEORETICAL BACKGROUND

Theoretical background of this research first focuses on explaining the fundamental discussions on creativity on the micro- and macro levels, creative confidence, how



creativity can be practiced, creative diversity, personalised learning as well as design-thinking and its educational applications. These elements are combined into a multi-level framework for creativity in higher education and in the theoretical model for personalised creativity development.

Creativity

Kampylis and Valtanen (2010) analysed 42 definitions of creativity and found that most include the following four components:

- “1. Creativity is a key ability of individual(s). 2. Creativity presumes an intentional activity (process). 3. The creative process occurs in a specific context (environment). 4. The creative process entails the generation of product(s) (tangible or intangible). Creative product(s) must be novel (original, unconventional) and appropriate (valuable, useful) to some extent, at least for the creative individuals(s).”

When approaching creativity from the micro-level perspective of individual cognition, divergent thinking has been identified as a necessary component of creativity. It consists of three key factors: 1. fluency, which refers to an ability to produce a great number of ideas, 2. flexibility, the ability to propose a variety of approaches, and 3. originality, the ability to produce new, unique ideas (Guilford, 1956).

How creativity happens in the human brain can be conscious or unconscious depending on the creative mode. One of the most known modes of creativity, flow experience, is unconscious and has no feelings or intentions. (Dietrich, 2015.) Flow can be described as something that makes activities, seemingly pointless or not, so enjoyable (Csikszentmihalyi et al., 2014). The role of unconsciousness is also present in Wallas's (1926; 1945) work in the form of incubation, an unconscious phase of the creative process (Guilford, 1956). Understanding the dialogue between conscious and unconscious stages is important. (Haapasalo & Kess, 2001).

Creativity also has physical (Slepian & Ambady, 2012), contextual and social dimensions. A growing number of studies have revealed that certain environmental stimuli can enhance human creativity (Daikoku et al., 2021). Similarly, the lack of environmental stimuli can also be beneficial for creativity (Salvi & Bowden, 2016). Moreover, even though there has been a lot of emphasis on the science of individuals' creativity (Amabile, 2017), creativity can also be understood as a social process. According to Elisondo (2016), creativity is not a solitary process, instead it emerges from dialogues, interactions and practices with others.

When looking at creativity from the macro-level, creativity can be understood as a phenomenon resulting from the dynamic interaction between an individual, a domain, and a field. According to the systems model of

creativity, the individual absorbs the information from the surrounding culture (the domain) and generates a variation or change in that existing information, whereas the domain is the cultural and symbolic system, composed of a set of rules, knowledge, and procedures preserving and transmitting information to individuals, constituting the tradition that the individual aims to change. The field refers to the social organisation of the domain, consisting of gatekeepers who evaluate the individual's novelty and select which variations or changes are valuable enough to be incorporated into the domain (Csikszentmihalyi, 2014).

Creative confidence

Creative confidence can support creativity of individuals by enabling them to apply imagination and creative actions in their specific fields, regardless of whether the field is traditionally considered “creative”. The term creative confidence refers to a fundamental belief in one's creative abilities and courage to act on new ideas – thoughts and action. It can also be described as a “way of experiencing the world that generates new approaches and solutions”. The philosophy behind the concept of creative confidence lays on the core belief of every person possessing creative potential that can be tapped and trained through effort and experience (Kelley & Kelley, 2013).

Creative confidence is closely related to the concept of self-efficacy, which refers to the belief that individuals can create positive change and are more likely to accomplish what they set out to do. The process of gaining creative confidence and self-efficacy often involves overcoming obstacles blocking the creativity, particularly the fear of failure. Overcoming the obstacles and growing the confidence happens through action—taking one step at a time through experiencing a series of small successes (Kelley & Kelley, 2013).

Fostering creative confidence can be considered as a key component of developing higher education students' creativity. Individuals with better confidence in their creative abilities are more likely to engage with creative tasks and problem solving (Beghetto & Karwowski, 2017). Moreover, growing evidence base suggests that creative self-beliefs play a crucial role in different aspects of the creative process (Anderson & Haney, 2021).

Training creativity

In the context of this research, creative abilities of an individual are understood as intellectual skills that can be trained. This training can take place through formal practice, such as creativity training courses and exercises, through the use of creativity methods and techniques, such as brainstorming (Guilford, 1956). Some types of training have been proven more effective than others, for example idea production and cognitive training have been found particularly effective (Scott et al., 2004). A wide range of training methods have been used in the context

of higher education, design thinking being highly popular (Boronat & Choueiry, 2022).

Creativity can also be trained as a habit. Like any habit, creativity can either be encouraged or discouraged. Providing right opportunities, encouragement and rewards can promote engaging in creative habits (Sternberg, 2007). In addition to promoting the habit of approaching problems creatively, a variety of specific creative habits to enhance creativity are presented in literature. These habits vary from taking care of one's physical, mental, and social well-being (Hope, 2015) as well as developing time management skills and collecting diverse experiences (Scheffer *et al.*, 2017) to doing something ordinary differently every day (Hokanson & McCluske, 2016). Ibáñez de Aldecoa *et al.* (2021) proposed that mental fixations to certain habits can hinder creativity. On the other hand, Sternberg (2007) also admits that creativity (a novel response) as a habit (a routine response) may sound paradoxical.

Creative diversity

Life experiences and individual differences in personality traits, cognition and social behaviour affect creativity. Still, only little is known about the psychological and environmental factors influencing the in situ creative behaviour. This is required to understand and enhance creativity in larger population (Amabile, 2017).

It is critical to understand individual differences between people when aiming to improve the creative performance of both individuals and collaborative teams (Berlow *et al.*, 2021). The following quote illustrates the point through a botanical example.

“Each plant species on earth is a unique creative solution to the universal problem of life – how to survive, grow, and reproduce. Every unique combination of plant forms and strategies for solving this problem has its own advantages and trade-offs, and each has its own set of environments and habitats in which it thrives (or does not thrive)” (Berlow *et al.*, 2021).

The research with a sample of ~10 000 people independent of discipline or gender, discovered people vary widely in the habits, behaviours, and contexts in which they feel most creative (Berlow *et al.*, 2021).

Personalised learning

The aim of a personalised learning approach is to personalise the learning experience according to the unique needs, goals, and skills of individuals (Shemshack *et al.*, 2021). The roots of personalised learning are in the progressive education philosophy of John Dewey, William Kilpatrick, and others in the early 20th century (Redding, 2016). In the context of higher education, the potential benefits of personalised learning for students are motivation, engagement, achievement of potential,

satisfaction and career progression (Becket & Brookes, 2012). The critique towards the approach concerns the conceptual fuzziness as well as commercial and self-oriented philosophies behind personification (Prain *et al.*, 2013).

Even though the popularity of personalised learning is rising in the field of education (Zhang *et al.*, 2020), there are only a few solutions for personalised creativity development for higher education. These solutions focus mainly on e-learning programs customising the content for the learner's individual needs (JongHo & Kim, 2010; Lin *et al.*, 2013).

Design thinking and its educational applications

Design thinking is a human-centric and iterative process for tackling complex and ill-defined problems or problems that cannot be described (Dam, 2023). Design thinking's roots are in “designerly thinking” which is an academic stream of discourse concerning design practice, focusing on the specialized skills and theoretical understanding of the professional designer. The newer stream adopted into this research “design thinking” is a discourse where design practice and competence are used beyond the design context (including art and architecture), for and with people without a scholarly background in design, particularly in management (Johansson-Sköldberg *et al.*, 2013).

The design thinking process consists of three to seven steps. A variety of different versions of the process exist, but the most widely spread version, the five-step design thinking process (Table 1) was originally presented by the Hasso Plattner Institute of Design at Stanford (the “d.school” model) (Dam, 2023). Every step has its own purpose, and they are equally important (Wolniak, 2017).

Table 1. Summarised five-step design thinking process from Hasso Plattner, Institute of Design at Stanford, An Introduction to Design Thinking Process Guide

Step	Purpose
<i>Empathise</i>	Conducting user-centric research to gain an empathic understanding of the problem addressed
<i>Define</i>	Organising and analysing the information gathered during the empathise-step for defining the core problems
<i>Ideate</i>	Generating solution ideas based on the discoveries of the previous stages
<i>Prototype</i>	Producing inexpensive, but tangible scaled-down versions of different solution ideas to investigate the result of the ideation
<i>Test</i>	- Testing the best prototypes - Testing often leads to redefining further problems or looping back to previous stages to iterate the solution.

As a powerful process to enable creative solutions (Brown, 2008; Liedtka, *et al.* 2013; Pressman, 2018) design thinking has spread to different fields (Rösch *et al.*, 2023) and hence is no longer applied solely to developing

solutions. For example, design thinking has been harnessed for educational purposes (Panke, 2019), especially in transdisciplinary settings (Taimur et al., 2023). Also, the personal and professional development concept of life design by Burnett & Evans (2016), has adopted the design thinking process (Todt et al., 2024).

Despite the increasing significance of design thinking in the educational field, applying design thinking to education can sometimes lead to oversimplifying the complexity of implementing design knowledge (Kim & Tan, 2022). When approached from positivistic perspective and following principles of user-centeredness and uncritical ideation, design thinking may struggle to address new contexts. New systemic and reflective paradigms and practices, rather than user-centred and ideative, must be incorporated to address new contexts (Verganti et al., 2021).

A multi-level framework for creativity in higher education

Combining the elements of the theoretical background, a multi-level framework for personalised creativity development model is outlined in Figure 1. Designing personal creative strategies through the five-step design thinking process was hypothesised to produce personalised learning to increase creative confidence by bridging individual cognitive development and systemic engagement in the same process.

Design thinking and the five-step design thinking process was chosen as a basis of the model to provide a clear step-by-step structure, which is still iterative. Despite the decided approach the roots of design thinking in discourse of “designerly thinking” can be seen in the framework, for example, Lawson’s (2006 [1980]) work with psychology of creative design (Johansson-Sköldberg et al., 2013). Still instead of turning research information into forms designers can use to increase their creativity as in Lawson’s work, the suggested framework can be

applied outside the design fields aiming for investigating personal creativity.

Each step can be modified to support creativity through reflective practices and hands-on experimentation as in other pedagogical applications targeted for personal development, following the logic of design thinking, but changing the target towards the self. The empathise-phase invites the students to empathise with their own creative self to increase creative self-awareness and their relationship with the surrounding system. The define-phase supports self-evaluation and seeking information on how to overcome obstacles in creativity. Moving forward, the ideate-phase is a structured application of divergent thinking, training the cognitive skills of fluency and flexibility in interaction with other people. The prototype-phase supports the formulation of a concrete creative strategy that can be tested and iterated in interaction between the individual and the surrounding system including the environment, domain and field.

Despite the critique towards applying design thinking into self-development, the proposed model is hypothesised to enable a deeply personal learning process including interaction with peers, field and everyday life of a university student. As a framework, design thinking can be justified, as when applied in the way the model suggests, it has connections to pedagogy of making. Pedagogy of making (Ingold, 2013; Iandoli, 2023), which is about learning by doing and by understanding and overcoming material, technological, and social constraints.

On a cognitive level, connecting students’ creative self-beliefs and cognitive skills happens through the active, reflective process known as creative metacognition (Anderson & Haney, 2021). The iterative nature of the process supports continuous development of creative strategies and avoiding sticking with repeating certain habits.

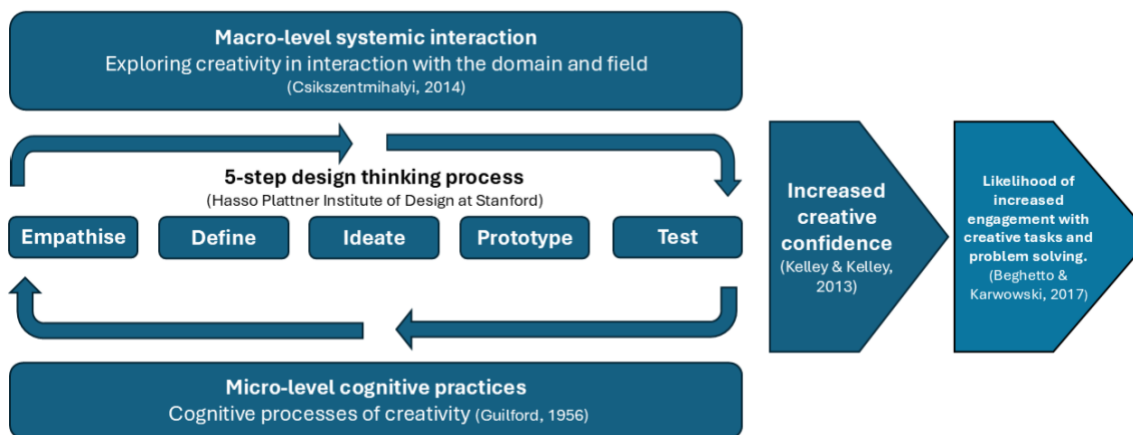


Fig. 1. The theoretical model for personalised creativity development

METHOD AND DATA

This research is a quasi-experiment (Gopalan *et al.*, 2020) testing a hypothesis through exploratory qualitative case study (Yazan, 2015) on a novel pedagogical intervention, which can also be understood as a pedagogical prototype. The qualitative data collected from the experiment is analysed through directed content analysis (Hsieh & Shannon, 2005) to answer the research questions two (RQ2) and three (RQ3) to form new hypotheses for developing the model and provoke further research. The structure of the research is summarised in Figure 2.

A quasi-experiment is a research design used in education for establishing causal evidence regarding the effects of policies or interventions when a full randomised controlled trial is not possible, feasible, or ethical (Gopalan *et al.*, 2020). In the context of education, an exploratory qualitative case study can seek to understand, for example, how a pedagogical intervention works and why. It can provide intensive, holistic description and analysis of the phenomenon to gain deep understanding and conceptualisation (Yazan, 2015). This approach is often essential in the early stages of new research, because it can help to generate hypotheses and describe the context and mechanisms for further research (Gopalan *et al.*, 2020) and is hence suitable for this early-stage research.

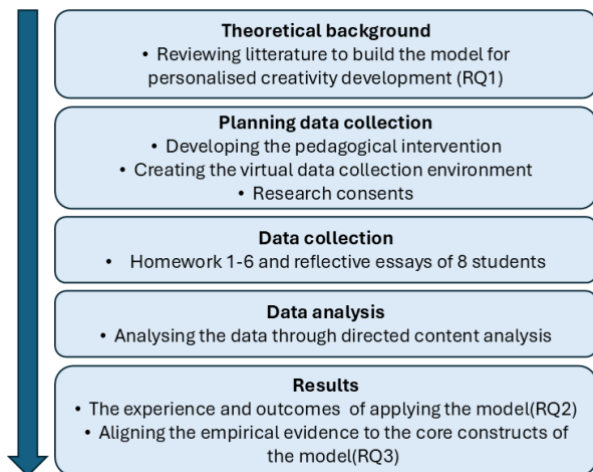


Fig. 2. The structure of the research

Pedagogical intervention

The empirical section of this research investigates the outcomes of using the five-step design thinking process for personalised creativity development. The modified process was implemented as a creativity development module in the International cross-disciplinary product development project (IPD) -course in autumn 2023, at the Department of Industrial Engineering and

Management. The IPD project-course was master's level and lasted for half a year, whereas the personal creativity development module lasted for two and a half months, starting at the beginning of the course.

The module consisted of six online homework (Appendix A) and one live workshop (Appendix B). The exercises of the module had to be submitted as Microsoft Teams assignments weekly, and they covered all the steps of the five-step design thinking process from the perspective of personalised creativity development. The purpose of each step and implementation of the exercises is described in Table 2. In addition to the homework, at the end of the course the students wrote final essays reflecting their whole learning experience.

Table 2. The implemented five-step design thinking process for personalised creativity development

Step	Purpose	Implementation
<i>Empathise</i>	• Empathising with one's creative self by drawing a creative self-portrait	Homework 1
	• Identifying one's creative strengths and development needs	
<i>Define</i>	• Stating the most important personal creativity blockers	Homework 2
	• Finding information about the blockers and how to overcome them	
<i>Ideate</i>	• Discussing the definition of creativity	Collaborative workshop
	• Ideating creative strategies	
<i>Prototype</i>	• Selecting the best idea	Homework 3
	• Coming up with a context, notification and motivation for the strategy.	
<i>Test</i>	• Testing the creative strategy in real life	Homework 4,5 & 6
	• Reporting the experiences in a diary	
	• Iterating the strategy when needed	

Participants and context

The participants of this research were eight students (N=8) from the University of Oulu attending the IPD-course. 5/8 of the students studied the field of industrial engineering and management, whereas 1/8 studied finance, 1/8 international business management and 1/8 fibre and particle engineering. The participants were culturally diverse as 3/8 of the participants were from Finland, 2/8 from Sri Lanka, 2/8 from Bangladesh and 1/8 from Pakistan. The participants were mostly master's students, as 6/8 were at the master's level, 1/8 at the bachelor's level, and 1/8 at the doctoral level of their studies. Their age varied from 20 to 37 years, with an average age of 28.

The IPD-course consisted of ideating and prototyping a product idea and learning to use FabLab to create prototypes. The course included innovative, interdisciplinary and intercultural groupwork to create product prototypes. The course consisted of contact teaching and homework, including the personalised creativity development module. The module was integrated into the course to support the students' creativity with a new, personalised approach.

Data collection

The data for this research consists of homework 1-6 (Appendix A) and two-page reflective essays (Appendix C) that were collected via Microsoft Teams from the eight students participating in the project course. The collected data was 59 pages in total containing deep reflection throughout the module. The homework provided data from the learning during the process, whereas the reflective essays concentrated on the students' analysis of their learning experience.

The research bulletins and consent forms were handed to the students at the beginning of the course. The students were aware of the research and what data was collected, for what purposes and where and how long it will be stored. They were also aware that their personal data will not be disclosed in any presentations or publications, and that they had the right to withdraw their participation to the research at any time without consequences or penalties.

No interview- or observational data was collected from the intervention as the researchers didn't want to interrupt the course the module was integrated in or decrease the willingness of the students to participate in the research by heavy data collection. Also, creative metacognition and applying creative strategies is something that is difficult to observe as it may not be visible and it can also take place outside the classroom. For preliminary research the homework and learning diaries were sufficient as the exercises allowed continuous reporting of the students' journey and reflecting the entire learning experience.

Data analysis

The data was analysed through directed content analysis. The process of directed content analysis is a structured, theory-driven and deductive approach to qualitative content analysis that is guided by existing theory or prior research. The purpose of the method is to validate or conceptually extend a theoretical framework or theory. (Hsieh and Shannon, 2005.) In the context of this pilot study, the goal of the analysis was to validate the hypothesis, the model for personalised creativity development, to create new hypotheses for further research.

By following the directed content analysis by Hsieh and Shannon (2005) the analysis started by identifying

the framework from existing theory and forming initial codes based on that.

After identifying the initial codes, the full dataset consisting of the homework 1-6 and the reflective essays was read through carefully several times and coded under the priori coding categories, including contradicting data relevant to the coding categories and research questions. The new sub-categories were added under the priori coding categories to form the final coding framework. Another researcher reviewed the coding to ensure the reliability of the coding. The final coding framework was:

a. Creative Confidence: Self-reported increase in creative confidence, reduced fear of failure and shift in mindset from creativity as a fixed trait to a developable process.

b. Creative Strategies: Reported, intentional creative strategies the students tested and developed during the process.

c. Cognitive Processes: Demonstrations of divergent thinking, reframing problems, making new connections and utilising the concept of incubation during the process.

d. Systemic Awareness: Demonstrations of awareness of systemic engagement with domain and field and factors hindering or boosting creativity.

e. Process Experience: The experiences, feelings and perceived outcomes of the five-step design-thinking process and its specific phases.

Coding for creative confidence and the rest of the framework was done by inferring from students' statements—for example, indications of reduced fear of failure—rather than by measuring it with direct questions.

The themes of the analysis are presented in the following empirical results -section.

EMPIRICAL RESULTS

The experience and perceived outcomes of the model

Empathise

The students found the empathise-phase to be an opportunity to approach their own creativity with empathy and gain understanding about themselves as creative beings in the surrounding system, acknowledging how the system affects their creativity.

"I thrive in environments that foster creativity, characterized by positivity, encouragement, and ample resources. Collaborating and brainstorming with a relevant group of people also contribute to generating creative ideas." (Student 6)

The students experienced that the empathise-phase allowed them to be more creative and start searching for their inner creativity, finding themselves as creative individuals as an outcome. Other perceived outcomes

from the empathise-phase were learning to be empathetic to oneself when practicing creativity. The students hoped to utilise the idea of empathy throughout their professional career.

“One session of this module was amazing where I had to draw my creative self to be empathized and an example of an owl was provided as an example. After participating, this session allowed me more to be creative and started searching my creative inside in me. Then I finally found myself as a creative individual and the moment of being creative.” (Student 1)

Define

The students felt that self-reflection played a pivotal role in the define-phase. The exercises of this phase guided the students to think how to define and overcome creativity blockers. This increased their self-awareness of how to improve their creativity. During the phase, students found that they are not alone with their creative struggles and other people have already been thinking smart strategies to tackle similar issues. By connecting the information available to their own reflections (including the systemic awareness), the students were able to find strategies to tackle their creativity blockers.

“To go into a flow state, I often draw inspiration from other sources. Harjo (2018) suggests, that to remove creative blocks, individuals can draw inspiration from other artists and write about thoughts and problems. I feel that journaling and using some arts and culture as inspiration helps for sure. I often find myself listening to some music, when I face a creative block and it has thus far eased my way to get back into the flow state of creativity. Most helpful of all the tools that I have used, is to suppress any feelings of judgement during the creative process and just let those ideations and creations come out.” (Student 2)

Ideate

The ideation phase allowed collaboration between the students. In this phase, the students experienced being able to create new ideas when sharing their thoughts with others. As a result, the students felt they were “exposed” to diverse ideas and being able to exchange feedback.

“Cycling is the best moment for me to think creative although, during the module and class, the moment I shared my ideas with others and discuss with them about my thinking, and receive feedback and others thoughts made me think in a different way.” (Student 7)

Prototype and Test

The students found testing the strategies easy, fun, refreshing, motivational, hopeful, relieving, focused and mindful. Even though the testing experience was positive and rewarding, the students found testing also irritating and awkward. They encountered some practical

challenges, such as difficulties in remembering to test. They also found testing increasingly difficult in some contexts and reported feeling stuck with their old ways when trying to think in new, more creative ways with the help of the strategies.

“Even though it is easy to test my creative habit, it is hard for me to find a good idea among a few ideas that pop up in my mind. Sometimes, I feel like all the ideas do not make sense. That is challenging in this habit.” (Student 4)

The students described their experience with rich metaphors to express the mixed feelings that arose:

1. “At times it felt like a child that was trying to learn to walk; it felt tiresome, difficult, forced – but there was a goal to keep on going standing by my own legs.” (Student 2)

2. “Remembering to actively keep up the habit and make it happen smoothly, as in, not a forced, external and fabricated process where I “play” to be creative and rather feel that the habit occurs organically.” (Student 2)

3. “I am feeling like when you get the feeling when you first learn how to drive a car my feelings are same like that.” (Student 6)

As an outcome, the students experienced that prototyping and testing the creative strategies pushed them to closely examine whether the strategies they were using were effective. Some students reported also realising their proneness to underestimating their creative skills and being surprised of the effectiveness of the strategies.

“At first I was really surprised by how effective a simple habit like pausing when faced with a problem could be” (Student 1)

Overall process experience and perceived outcomes

Experience

Despite some scepticism at the beginning, the students experienced design thinking as a practical process, structuring an interesting journey into inner creativity.

“At the start of the course I was really skeptical and didn’t really believe something would change during the course. Can you really teach someone to be creative? It felt strange at first like I was trying to force my scattered thoughts into tidy boxes. But as the weeks passed something started to change.” (Student 1)

Perceived outcomes

The key outcomes students perceived was an increased creative self-awareness, including gaining new understanding of creative strengths and “optimizing”

creative thinking. On the other hand, the process supported the students to learn more about their development points and reasons behind struggling with creativity. The students also increased their understanding of thinking processes and patterns behind creativity and explored their hidden creative skills.

“Mostly, the reflective course assignments helped be to understand myself better and why it is that I was struggling with my own design thinking and innovations; the mind is a wonderful thing and only imagination is the limitation to what can be achieved. However, the mind is also the shackles that hold the imagination in a firm place, creating boundaries to what processes are acceptable and what sort of leeway in creativity is given in the context at hand.” (Student 2)

Moreover, the journey provided new insights and viewpoints, even arousing curiosity towards how to spark creativity not only in themselves, but in others as well. They found their learning valuable also for their future studies and work. The outcomes of the process are summarised in Table 3.

Table 3. The outcomes of each step of the design thinking process for creativity development

Phase	Outcomes
<i>Empathise</i>	- Realising creativity strengths and blockers - Learning empathy towards oneself - Allowance to be creative - Beginning to search inner creativity - Finding oneself creative
<i>Define</i>	Learning about how to avoid and get rid of creative blockers, as well as to develop creative strengths
<i>Ideate</i>	- Ideating a variety of solutions for same problem - Getting help for thinking differently about how to practice creativity through discussion and feedback - Getting exposed to diverse ideas
<i>Prototype</i>	Reflecting on how to improve and use creative strategy in a productive way in daily life
<i>Test</i>	- Examining the effectiveness of the strategies - Understanding through testing the power of creative strategies

Alignment of the theoretical model and empirical evidence

Based on the findings, the students' reflective accounts align with the core constructs of the proposed model for personalised creativity development allowing the students to reflect and connect themselves to their micro-level cognitive processes as well as the macro-level system, leading to self-reported increase in creative confidence as presented in Figure 3.

Macro-level systemic interaction

The students demonstrated being able to concretely engage with the macro-level system when developing the

creative strategies. During the process, the students interacted with their environment, social environment, domain and field. This is in line with the systemic model of creativity (Csikszentmihalyi, 2014). The strategies can potentially be a structured way to interact with the field and domain as an individual, and as a part of daily life.

The students were constantly evaluating their relations to the macro-level system through metacognitive practices. Learning from these actions taken and overcoming creative obstacles in their living environment led to knowledge creation of how to affect one's creativity. This is in line with Ingold's work (Ingold, 2013; Iandoli, 2023).

“I learned that giving myself the space to think actually leads to better, more creative solutions.” (Student1)

Micro-level practices

On micro-level, the students demonstrated divergent thinking by ideating multiple ways to boost their creativity, taking inspiration from macro-level system, such as discussions with classmates or searching internet.

“The module comprised both individual and collaborative components. Individual reflection provided a valuable opportunity to understand and optimize my creative thinking. Collaborative learning exposed me to diverse ideas and creative habits, fostering a pragmatic exchange of feedback.” (Student 8)

Similarly, the students reported being able to reframe their creativity blockers to boosters, turning conditions interrupting creativity into favourable, or turning weaknesses into strengths.

“When we try to attend the complex case and resolve the issue with a creative idea, it is rare to see that solution emerge easily. But we breakdown the whole problem into small fragments and write it down (probably in the paper) there would be more probability to get an idea more easily and quickly. This is what I have experienced during the day to day activities whether the creative habit is applied.” (Student 5)

The students were also able to create new connections when developing their creative strategies, and as a result of their creative strategies, when working on course assignments and outside the university.

“Like I came up with the Idea of making a reflector on a bus stop where I missed my bus because the bus driver didn't see me because I was standing in the dark. So I make my bus card as a reflector. I think this is a unique idea and creative too as though this is a very small thing to do but it was creative, and it is like I have solved some problem which gave me a great pleasure.” (Student 6)

These demonstrations suggest the model may possess potential to systematically invite the three key factors of divergent thinking aligning with Guilford's (1956) concept.

Creative strategies as mediators

The variety of strategies developed and tested by the students was in line with the idea of creative diversity (Amabile, 2017; Berlow *et al.*, 2021). Some of the strategies were active ways to affect the cognitive processes such as breaking down problems or purposefully seeking atypical connections between concepts. Some students preferred activities like cycling alone to spark the creative process, while some students' strategies directly utilised incubation. There were also students who included both conscious and unconscious phases inside a single strategy. This is in line with Wallas's (1926; 1945) idea of incubation.

"I learned that it's really brilliant that my conscious-self steps away from the frustrating problem while my unconscious-self aka my brain keeps working on it and my conscious-self collects the results after a period of time without being aware of all the work being done for it." (Student 1)

Different dimensions of creativity, such as social, physical, environmental dimensions could be found from different strategies. This is in line with work of Slepian & Ambady (2012), Daikoku *et al.* (2021), Salvi & Bowden (2016) and Elisondo (2016).

"I will add a "mindful breath" before starting to study each day. It includes taking three deep breaths at my desk to center myself and create a calm mindset." (Student 8)

As a result of the process, students reported experiencing increase in their creative confidence. The confidence increase could also be interpreted from the comments where students demonstrated increased creative self-efficacy or experiencing progress in creativity.

"I felt excited and like awakening thing that was already present within me, but I didn't know of it before." (Student 6)

"A surprising aspect was the noticeable improvement in my creativity." (Student 8)

The students wrote about finding their strategies as a source of creative confidence.

"This habit worked like magic honestly." (Student 1)

Some students also reported reduced fear of failure as they grew to think that it can be useful to allow oneself

to fail when creating something new. They were also able to overcome barriers of perfectionism and critical mindset towards their work.

"In this module, I gained practical insights into my creative process. The realization that my perfectionist and critical mindset hindered my creativity was a notable takeaway. By overcoming these barriers and sharing incomplete ideas, I discovered a more authentic and productive approach to creativity." (Student 8)

During the process the students reported realising how reachable creativity can be. They began to see that creativity is not a fixed talent, something you're born with, but an evolving process and a skill one can get better at. The students grew to believe they could have some control over their thought processes by tweaking them and adjusting their approach to enhance their creativity. The students also pondered that learning to be creative can be a decision and reached through persistence.

"The coolest thing I've figured out is that being creative isn't something you're just born with and that's that. It's more like a skill something you can get better at if you keep at it. And that's exactly what I plan to do to keep at it and see how much more creative I can get." (Student 1)

"Often, my thought process seems to flow in a similar manner and it is difficult to distort this process and try to think in a different manner – almost impossible, I'd say. However, it is possible to use my habitual thought processes and implement them to the creative habit; take existing identified 'things' (in the absence of a better word) and place them in a different context and ponder how that would impact the 'thing' in itself, or the novel context it has been placed in." (Student 2)

"When you decide to be creative you may not come up the most creative idea but with every step you will be closer to the objective, and you will keep walking." (Student 6)

The findings are in line with the idea of reinforcing circle of building creative confidence. The data suggests that when the students concentrated on their creative abilities and how to develop themselves, they got engaged to test and develop the strategies to fit their needs and then experienced small successes building creative confidence.

"Each time I use this technique I see the results and it gives me hope so each time it gets easier to trust the technique and let go of the problem at hand even when I have a deadline." (Student 1)

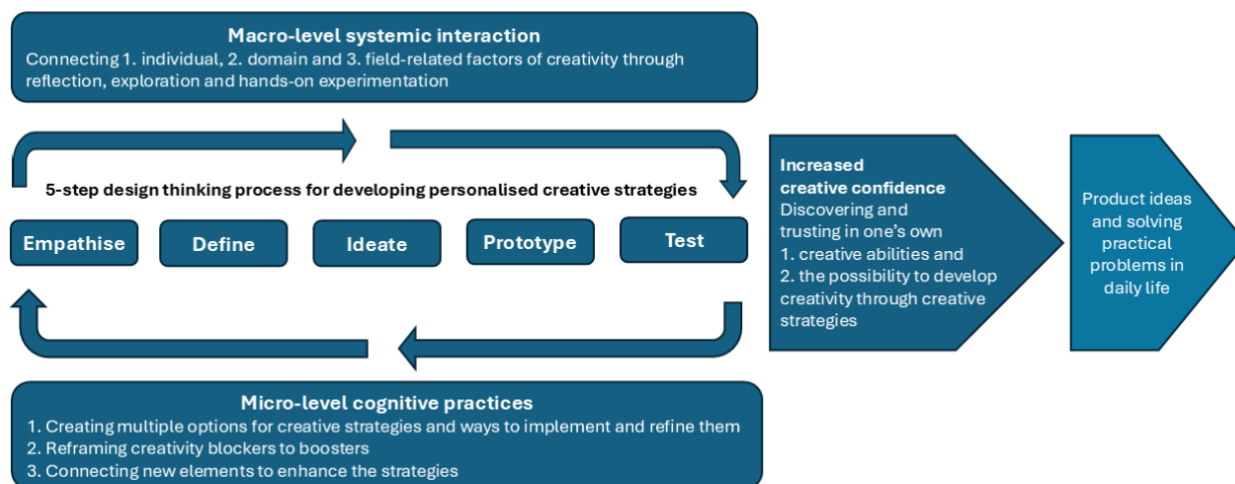


Fig. 3. The alignment of the empirical data with the core constructs of the personalised creativity development model

DISCUSSION AND CONCLUSIONS

This pilot study presents a new idea for personalised creativity development by applying design thinking not only as a method to increase creative confidence supporting development of creative outputs, but also to support creative metacognition on how to develop individual creativity. Even though the approach was individual oriented, developing the creative potential of individuals is crucial for creative teams (Berlow et al., 2021).

The empirical findings are in line with the proposed theoretical model which suggests the five-step design thinking process offers structure for bridging the cognitive processes of creativity to systemic engagement even when considering the limitations of design thinking (Verganti et al., 2021) and the abstract and multifaceted nature of creativity. This thread is clearly present in the following quotation:

“The whole process was very practical and it felt like I was getting to the core of creativity. The assignments weren’t just tasks to complete they were like personal challenges. They made me aware of my patterns especially when I hit a wall with a problem.”
(Student 1)

Although seeming promising, confirming the results requires further research. Hence the main contribution of this study is opening up opportunities for novel pedagogical applications and research. The effectiveness of the module could be researched further with larger sample size, pre-post-tests and using a control group. Future research should also employ data triangulation. Larger scale research on how the model can be

implemented on innovation courses could be conducted at IdeaSquare as it organises innovation courses frequently for a diverse student groups. Also, how the outcomes align with the benefits of personalised learning, such as increase in motivation, engagement and achievement of potential and satisfaction, would be valuable. In addition, the role of incubation in testing creative strategies would be an interesting topic to research. The students found testing the strategies difficult as testing the strategies was sometimes subconscious. At the same time, they felt being able to affect their subconscious mind with their personalised strategies designed for their needs.

The results of this study should be considered as preliminary research, creating new hypotheses. As the data was analysed through directed content analysis, the data outside the scope of the research questions were left out from this research. Such data included using the process for developing language skills and reflective accounts related to the IPD-course, not the creativity development module itself.

It must be acknowledged that the students’ positive experiences of the module may be due to their willingness to please the researcher. Also, the students may have been open for the exercise, as they had chosen to undertake a course, which is innovative by nature. The module should be tested on students, who have no prior experience on design thinking and whose attitudes towards developing creativity lean towards negative. Another limitation of this research is that using directed content analysis contains a risk of finding evidence supportive rather than unsupportive of a theory (Hsieh & Shannon, 2005). These reliability issues need to be considered in the future research to understand the potential the model holds for developing creative confidence and creativity.

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CONFLICTS OF INTEREST

None to declare.

REFERENCES

- Álvarez-Huerta, P., Muela, A., & Larrea, I. (2022). Disposition toward critical thinking and creative confidence beliefs in higher education students: The mediating role of openness to diversity and challenge. *Thinking Skills and Creativity*, 43, 101003.
- Amabile, T. M. (2017). In pursuit of everyday creativity. *The Journal of Creative Behavior*, 51(4), 335-337.
- Anderson, R. C., & Haney, M. (2021). Reflection in the creative process of early adolescents: The mediating roles of creative metacognition, self-efficacy, and self-concept. *Psychology of Aesthetics, Creativity, and the Arts*, 15(4), 612. <https://doi.org/10.1037/aca0000411>
- Beghetto, R. A., & Karwowski, M. (2017). Toward untangling creative self-beliefs. In *The creative self* (pp. 3-22). Academic Press. <https://doi.org/10.1016/B978-0-12-809790-8.00001-7>
- Becket, N., & Brookes, M. (2012). The potential benefits and challenges of personalising UK higher education. *Journal of Hospitality, Leisure, Sport & Tourism Education*, 11(1), 21-28.
- Berlow, E., Canon, S., DeBiswas, K., Gurman, D., Jacoby, S., Simmons, L., ... & Runco, M. (2021). Creative diversity: Patterns in the creative habits of 10,000 people. *arXiv preprint arXiv:2108.12759*. Retrieved April 4, 2025, from <https://arxiv.org/abs/2108.12759>
- Boronat, B. C., & Choueiry, H. (2022). Transforming creativity skills into creative habits. *Arab Economic and Business Journal*, 14(1), 80-93.
- Brown, T. (2008). Design thinking. *Harvard Business Review*, 86(6), 84-92.
- Burnett, B., & Evans, D. (2016). *Designing your life: How to build a well-lived, joyful life*. Random House
- Csikszentmihalyi, M. (2014). The systems model of creativity and its applications. *The Wiley handbook of genius*, 533-545. <https://doi.org/10.1002/9781118367377.ch25>
- Csikszentmihalyi, M., Abuhamdeh, S., & Nakamura, J. (2014). Flow. In *Flow and the foundations of positive psychology: The collected works of Mihaly Csikszentmihalyi* (pp. 227-238). Dordrecht: Springer Netherlands. <https://doi.org/10.1007/978-94-017-9088-8>
- Daikoku, T., Fang, Q., Hamada, T., Handa, Y., & Nagai, Y. (2021). Importance of environmental settings for the temporal dynamics of creativity. *Thinking Skills and Creativity*, 41, 100911. <https://doi.org/10.1016/j.tsc.2021.100911>
- Dam, R. F. (2023, October 16). The 5 stages in the design thinking process. *Interaction Design Foundation - IxDF*. Retrieved April 4, 2025, from <https://www.interaction-design.org/literature/article/5-stages-in-the-design-thinking-process>
- De Alencar, E. M. S., de Souza Fleith, D., & Pereira, N. (2017). Creativity in higher education: Challenges and facilitating factors. *Temas em Psicologia*, 25(2), 553-561.
- Dietrich, A. (2015). *How creativity happens in the brain*. Springer.
- Elisondo, R. (2016). Creativity is always a social process. *Creativity: Theories—Research—Applications*, 3(2), 194-210.
- Gopalan, M., Rosinger, K., & Ahn, J. B. (2020). Use of quasi-experimental research designs in education research: Growth, promise, and challenges. *Review of Research in Education*, 44(1), 218-243. <https://doi.org/10.3102/0091732X20903302>
- Guilford, J. P. (1956). The structure of intellect. *Psychological bulletin*, 53(4), 267. <https://doi.org/10.1037/h0040755>
- Haapasalo, H., & Kess, P. (2001). In search of organisational creativity: The role of knowledge management. *Creativity and innovation management*, 10(2), 110-118.
- Hasso Plattner Institute of Design at Stanford. (n.d.). *An introduction to design thinking: Process guide*. Retrieved April 4, 2025, from <https://web.stanford.edu/~mshanks/MichaelShanks/files/509554.pdf>
- Hsieh, H. F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research*, 15(9), 1277-1288. <https://doi.org/10.1177/1049732305276687>
- Hokanson, B., & McCluske, M. (2016). The creativity habit. In *Studio teaching in higher education* (pp. 192-206). Routledge.
- Hope, G. (2015). 20 habits to increase creativity & productivity you can use NOW. *Lifhack*. Retrieved April 4, 2025, from <https://composeronfire.com/wp-content/uploads/2015/01/20-Habits-To-Increase-Creativity-Productivity-You-Can-Use-NOW.pdf>
- Iandoli, L. (2023). Annual review article: The dual mindset of design-driven entrepreneurship: The case for a pedagogy of making and artefact-centred entrepreneurship education. *International Small Business Journal*, 41(4), 349-370. <https://doi.org/10.1177/02662426231170135>
- Ibáñez de Aldecoa, P., de Wit, S., & Tebbich, S. (2021). Can habits impede creativity by inducing fixation? *Frontiers in Psychology*, 12, 683024. <https://doi.org/10.3389/fpsyg.2021.683024>
- Ingold, T. (2013). *Making: Anthropology, archaeology, art and architecture*. Routledge. <https://doi.org/10.4324/9780203559055>
- Johansson-Sköldberg, U., Woodilla, J., & Çetinkaya, M. (2013). Design thinking: Past, present and possible futures. *Creativity and innovation management*, 22(2), 121-146. <https://doi.org/10.1111/caim.12023>
- JongHo, S. H. I. N., & Kim, Y. S. (2010). Design creativity education: Cognitive elements of creativity and an affective model for personalized learning. In *The 18th International Conference on Computers in Education* (pp.

- 268-273). *Asia-Pacific Society for Computers in Education*.
- Kampylis, P. G., & Valtanen, J. (2010). Redefining creativity—analyzing definitions, collocations, and consequences. *The Journal of Creative Behavior*, 44(3), 191-214.
- Kelley, T., & Kelley, D. (2013). *Creative confidence: Unleashing the creative potential within us all*. Crown Currency.
- Kim, B., & Tan, L. (2022). Design thinking the future: Critical perspectives on design studies, design knowledge, and education. In *Design praxiology and phenomenology: Understanding ways of knowing through inventive practices* (pp. 3-15). Springer.
https://doi.org/10.1007/978-981-16-3844-1_1
- Liedtka, J., King, A., & Bennett, K. (2013). *Solving problems with design thinking: Ten stories of what works*. Columbia University Press.
- Lin, C. F., Yeh, Y. C., Hung, Y. H., & Chang, R. I. (2013). Data mining for providing a personalized learning path in creativity: An application of decision trees. *Computers & Education*, 68, 199-210.
- Panke, S. (2019). Design thinking in education: Perspectives, opportunities, and challenges. *Open Education Studies*, 1(1), 281-306.
- Poláková, M., Suleimanová, J. H., Madžík, P., Copuš, L., Molnárová, I., & Polednová, J. (2023). Soft skills and their importance in the labour market under the conditions of Industry 5.0. *Heliyon*, 9(8), e17387.
- Prain, V., Cox, P., Deed, C., Dorman, J., Edwards, D., Farrelly, C., ... & Yager, Z. (2013). Personalised learning: Lessons to be learnt. *British Educational Research Journal*, 39(4), 654-676.
- Pressman, A. (2018). *Design thinking: A guide to creative problem solving for everyone*. Routledge.
- Redding, S. (2016). Competencies and personalized learning. In M. Murphy, S. Redding, & J. Twyman (Eds.), *Handbook on personalized learning for states, districts, and schools* (pp. 3-18). Springer.
- Rösch, N., Tiberius, V., & Kraus, S. (2023). Design thinking for innovation: Context factors, process, and outcomes. *European Journal of Innovation Management*, 26(7), 160-176.
- Salvi, C., & Bowden, E. M. (2016). Looking for creativity: Where do we look when we look for new ideas? *Frontiers in Psychology*, 7, 161.
<https://doi.org/10.3389/fpsyg.2016.00161>
- Scheffer, M., Baas, M., & Bjordam, T. K. (2017). Teaching originality? Common habits behind creative production in science and arts. *Ecology and Society*, 22(2).
- Schumpeter, J. A. (1983). *The theory of economic development: An inquiry into profits, capital, credit, interest, and the business cycle* (Reprint of the 1934 edition). Transaction.
- Scott, G., Leritz, L. E., & Mumford, M. D. (2004). Types of creativity training: Approaches and their effectiveness. *The Journal of Creative Behavior*, 38(3), 149-179.
<https://doi.org/10.1002/j.2162-6057.2004.tb01238.x>
- Shemshack, A., Kinshuk, & Spector, J. M. (2021). A comprehensive analysis of personalized learning components. *Journal of Computers in Education*, 8(4), 485-503.
- Slepian, M. L., & Ambady, N. (2012). Fluid movement and creativity. *Journal of Experimental Psychology: General*, 141(4), 625.
- Sternberg, R. (2007). Creativity as a habit. In *Creativity: A handbook for teachers* (pp. 3-25). University Press of America.
- Taimur, S., Peukert, D., & Pearce, B. (2023). Design thinking. In P. Orsten Philipp & T. Schmohl (Eds.), *Handbook transdisciplinary learning* (pp. 83-93). Springer.
- Todt, G., Wolf, B., & Maisch, B. (2024). Navigating peaks and valleys—Fostering resilience via entrepreneurial life design. *CERN IdeaSquare Journal of Experimental Innovation*, 8(3), 28-35.
<https://doi.org/10.23726/cjoi.2024.181>
- Verganti, R., Dell'Era, C., & Swan, K. S. (2021). Design thinking: Critical analysis and future evolution. *Journal of Product Innovation Management*, 38(6), 603-622.
<https://doi.org/10.1111/jpim.12610>
- Wolniak, R. (2017). The design thinking method and its stages. *Systemy Wspomagania w Inżynierii Produkcji*, 6(6), 247-255.
- World Economic Forum. (2025). *Future of jobs report*. Retrieved April 4, 2025, from
<https://www.weforum.org/publications/the-future-of-jobs-report-2025/digest/>
- Yazan, B. (2015). Three approaches to case study methods in education: Yin, Merriam, and Stake.
<https://doi.org/10.46743/2160-3715/2015.2102>
- Zhang, L., Basham, J. D., & Yang, S. (2020). Understanding the implementation of personalized learning: A research synthesis. *Educational Research Review*, 31, 100339.
<https://doi.org/10.1016/j.edurev.2020.100339>
- Zwir, I., Del-Val, C., Hintsanen, M., Cloninger, K. M., Romero-Zaliz, R., Mesa, A., ... & Cloninger, C. R. (2022). Evolution of genetic networks for human creativity. *Molecular Psychiatry*, 27(1), 354-376.

APPENDIX A: THE SIX ONLINE HOMEWORK PRESENTED IN THE MODULE

1. Homework - EMPATHISE with your creative self

Draw your own creative self-portrait with a description of your 1) creativity strengths and 2) development points and the 3) conditions that support and 4) block your creativity. You can do this on paper or by using a computer. An example of a creative self-portrait can be found behind this link: https://drive.google.com/file/d/1Gff_5qnA4J-PB6B1VqK3KjV5Vp__kSjL/view?usp=sharing

2. Homework - DEFINE your main creativity blockers

Take a moment and think about what tends to block your creativity. Find information from the internet or library about your blocker and how other people have overcome it. The material can be scientific articles, YouTube videos, blogs, etc.

Write a 400-word learning diary where you reflect on 1) how you were able to define your personal creativity blocker. 2) what new you learned about that specific creativity blocker. 3) Do you think some of the strategies people have used to overcome it would work for you?

Remember to write down your information sources (the references do not count as words). This homework supports you on the IDEATION session that will be held during the next IPD contact teaching session on 23.11.

3. Homework - PROTOTYPE your new creative habit

Write your creative habit in one sentence. If possible, also specify where, how and when / in which context you can implement your habit in everyday life. Also record how you are going to remind yourself to implement the habit and maintain motivation to repeat it.

4. Homework - Track TESTING your creative habit

The rest of this creativity module is dedicated to testing your creative habit. Now it's time to start a diary about testing your creative habit you wrote in the previous assignment. Your homework is to start the online diary and make your first entry, which should contain:

- 1) Were you able to test your habit during the previous IPD-session? If so, how did you test it?
- 2) Did you test the habit in some other context outside the classroom? If so, where and how did you test it?
- 3) What was easy about testing your habit?
- 4) What was difficult about testing your habit?
- 5) What did you learn when testing the habit?
- 6) How did you feel about testing the habit?
- 7) How did you remind yourself about testing the habit?
- 8) How did you motivate yourself to test the habit?
- 7) Do you think you should modify the habit somehow, and if so, how?

There is no word limit for the diary as long as you are able to reflect all the seven points listed above.

5. Homework - TESTING continues

The diary instructions are the same as in homework 5.

6. Homework - TESTING continues

The diary instructions are the same as in homework 5 and 6.

APPENDIX B: THE EXERCISES IN THE LIVE WORKSHOP

Exercise 1

- Discuss in pairs your key findings from empathise- and define -phases.
- Questions to support your discussions:
- What new things did you learn from yourself?
- Which tasks did you find easy? Why?
- Which tasks did you find difficult? Why?

Exercise 2

- Continue individually.
- Take inspiration from the discussion you just had.
- Ideate some creative habits.
- You can use a mind map or some other technique to support your work.
- The document has to be uploaded on Teams after the workshop.

Exercise 3

- Show your mind map to the same pair you worked with before.
- Together come up with some more habits or develop the existing ones.
- Add the ideas to your individual documents.

Exercise 4

- Start this homework individually and return the final version via Teams.
- Think about what was the best development idea that came out of your recent conversation.
- Think about what kind of habit you could come up with based on the idea.

TASK: Write the habit in one sentence. If possible, also specify where, how and when / in which context you can implement your habit in everyday life. Also record how you are going to remind yourself to implement the habit and maintain motivation to repeat it.

Remember to be realistic about making your creative habit one that you can repeat in your everyday life. You can also think about what might be preventing you from implementing the habit.

APPENDIX C: INSTRUCTIONS FOR THE REFLECTIVE ESSAYS

Write a 2-page essay about how you experienced the design thinking process as a mean for developing personal creativity? Use the 5 bolded questions to describe (what?) and analyse (how?) your learning experience. You can use the supporting questions if needed.

1. Describe and analyse your most important learning outcomes in this module. Supporting questions: Describe and analyse what affected your learning during this module. Describe and analyse what you would like to learn more about.
2. Describe and analyse the feelings you had during this module. Supporting questions: Describe and analyse what motivated you in this module. Describe and analyse what made you curious during this module. Describe and analyse what surprised you in this module.
3. Describe and analyse your most creative moment during this module.
4. Describe and analyse what you could/will do with the things you have learned during this module in the future.