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**DESIGN EDUCATION:
AN INVESTIGATION INTO
HOW IT IMPROVES IDEA GENERATION**

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Design Education:

An Investigation Into How It Improves Idea Generation

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A thesis submitted in partial fulfilment of the requirements
for the degree of Doctor of Philosophy

May 2021

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May 2021

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ABSTRACT

Design education develops a range of skills thought to be life-long relevant, and valuable for the design industry. The ability to generate ideas is one of the fundamental skills that is also fostered by design education. The exact pedagogical approaches of how this happens in design schools are not well documented or understood. It has been found that educators believe that encouraging design learners to expand their experiences and engaging in critical conversations improves the ability to generate ideas. On the contrary, utilising a supportive learning environment and implementing an empathic teaching approach does not appear as effective. Three traits are perceived to correlate with the capacity to produce ideas; these are: able to see relationships, Highly curious, and independent of thought. This study was conducted using a mixed-methods approach, with three separate studies: two surveys (n=104, n=167) and a series of semi-structured interviews (n=24). A multilevel research triangulation design allowed the data from one study to be used by another, combining the data into one overall interpretation. Finally, this dissertation concludes that various teaching strategies can influence several personality traits that influence the ability to generate ideas. Moreover, the teaching strategies examined in this dissertation have varying degrees of influence.

OUSTAMANOLAKIS, Michail

May 2022

Publications arising from the thesis

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Oustamanolakis, M. (2020). Personality Traits of Creative People. PolyU Design Degree Show 2020, Hong Kong. <https://doi.org/10.13140/RG.2.2.13613.92641>

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Alverata Typeface - The quick brown fox jumps over the lazy dog

This thesis is set in Alverata, a typeface designed by Dr. Gerard Unger (1942-2018), one of my design teachers with an enormously positive impact on my growth as a designer.

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Design Education:

An Investigation Into How It Improves Idea Generation.

1. Introduction

Note: this section contains biographical notes written in the first pronoun.

Design schools aim to transform novice, amateur designers (learners, students) into full-fledged professional designers. During this transformation, learners develop and obtain various skills and abilities, including the ability to generate ideas. Typically, design learners spend about three to four years in a bachelor program to undergo and achieve this transformation from novice to professional designers. Learners who may have started as amateur designers will have obtained the tools, developed mastery, and gained confidence during this time. Once they graduate, their skill to generate ideas has presumably transformed from an ability (being able to do something) into a skill¹ (doing something well). Presumably, graduates can generate a higher volume of ideas.

In this setting, the following question can be raised:

What are the teaching methods (or strategies) to foster the ability to generate ideas?

This question has been a genuine interest that motivated me to pursue this study. As a design learner, I have attended multiple design schools in different countries, including Greece, Finland, the Netherlands, Sweden, and China. My experience has been quite diverse. My design education journey (before pursuing my Ph.D. studies in design education) includes several institutions/programs (a complete list can be found in page [on page 349](#)). In my experience, each of these institutions aims to equip learners with competitive skills. These schools have sought to enhance creativity, develop self-confidence, and address problems from a designer perspective. My design education has consistently been omnipresent to generate ideas and ask learners to develop ideas, concepts, and scenarios.

¹ [Section 5.13, page 98](#), discusses the difference between skill and ability.

Regardless of undergraduate or graduate or what year of study I was in, it has been expected to come up with ideas throughout a student's progression to a professional. Consistently, from year one in my bachelor studies, until my doctoral studies in design. Fast forward to several years later, at the time of writing this dissertation, there is little documentation or literature on the teaching methods that significantly improve the ability to generate ideas

There is rich literature on creativity, especially in business, organisational management, entrepreneurship, and many psychology studies examining creativity from the psychological perspective. These psychology studies suggest various personality traits directly related to creativity, including idea generation. Subsequently, idea generation has an ever-growing body of literature.

However, little is written about the perceptions of design educators regarding how the idea generation ability is being fostered in design schools or elsewhere. More specifically, it is unclear which personality traits are believed to impact the growth of idea generation ability, nor which teaching strategies invoke these traits. This lack of literature combined with a genuine fascination with the subject matter led to this doctoral study's pursuit.

While both idea generation and idea evaluation are critical in creativity studies, this PhD thesis focuses explicitly on the ability to generate ideas. The evaluation of ideas, which follows as a natural next step after ideas are generated, is not looked at in this study. Evaluating ideas involves another mindset, where one has to shift attention from producing ideas to evaluating and selecting the ideas that seem workable (Puccio & Cabra, 2012, p. 202). This PhD explores how to improve the design students' ability to generate ideas, based on the perception of design educators, and does not examine how to evaluate or select ideas.

2. Background

While writing this manuscript, humanity is experiencing a period that would undoubtedly be considered unprecedented. The Covid-19 pandemic would have been described by many as an improbable event just a few weeks before the pandemic broke out. It has been such an unexpected event with severe consequences, with some industries being severely hit, most notably tourism and aviation. Experts and world leaders in tourism and aviation could not have predicted the pandemic's scale's impact on their respective industries.

A few years before the pandemic, Donald Trump's election was also considered an improbable event just a few weeks or days before it finally did happen. His rise to power and his rather unorthodox leadership style have brought a dramatic shift in the world order, which was also considered unlikely before his election. Another event considered highly unlikely only a few moments before it happened was the 2011 September 11 attacks, which had an enormous negative impact on the world community. The 21st century can be characterised as a period with multiple improbable events or incidents that have shifted and altered humanity's course in various unpredictable ways.

Such a new world order involving unforeseen challenges and unique problems that humanity never had to address before (for instance, tackling depleting non-renewable natural resources) requires a new skill set. A phrase by a former client² encapsulates this sentiment with an excellent analogy: *"We are now building an aeroplane as we are flying it. That is something that we have never done before"*. While this shift is gradually taking place, the near future designers will respond to these circumstances. As such, they will require a set of skills appropriate for the future that is coming.

² Before this PhD study the author was a UX design consultant.

A few lists have been proposed with the skills needed in the new world order. While they are not solely explicit to designers, it worth taking notice of. The World Economic Forum (2020) has suggested a list of 15 skills that “will help you get hired in 2020”, based on LinkedIn data that includes 20+ million job listings. They provide two lists (see below)—one with hard skills and one with soft skills (even though they do not explain the difference between hard and soft skills).

Hard skills

1. Blockchain
2. Cloud and distributed computing
3. Analytical reasoning
4. Artificial Intelligence
5. UX design
6. Business analysis
7. Affiliate marketing
8. Sales
9. Scientific computing
10. Video production

Soft skills

1. Creativity
2. Persuasion
3. Collaboration
4. Adaptability
5. Emotional Intelligence

A terrific remark that can be made here is that on the list of hard skills, number three, ANALYTICAL REASONING, is often a pre-requisite for multiple design positions and practising critical thinking to produce and improve better design concepts. Another remark is about number five, UX DESIGN (user experience). It is a design discipline that appeared relatively recently as a designated role with a designated title and is now reaching maturity.

With these two remarks, based on this list, design (especially UX) can be considered a skill in such high demand that it will help job seekers who have it to land a job. Perhaps, the most relevant and significant remark to this study regards the first skill on the soft skills, CREATIVITY. According to this list, job seekers who are creative individuals will have an easier time securing a job. Number 5, EMOTIONAL INTELLIGENCE, is also notable, as it highly relates to empathy, a key pillar concept in the contemporary design industry. Another list published by Forbes (Beckford, 2020) suggests the fifteen skills needed to succeed in 2020 and beyond. The list is provided below:

1. Complex problem-solving.
2. Critical thinking and analysis.
3. Creativity, innovation, ideation, originality, and initiative.
4. People management.
5. Coordinating with others.
6. Emotional intelligence.
7. Judgment, reasoning, analytical thinking, and decision making.
8. Service orientation.
9. Negotiation.
10. Cognitive flexibility.
11. Active learning and learning strategies.
12. Technology design and programming.
13. Leadership and social influence.
14. Systems analysis and evaluation.
15. Cultural sensitivity and awareness.

This list has multiple items associated with designers, such as complex problem solving, critical thinking, creativity, ideation, reasoning, and more. By looking at this list, it can be assumed that designers will have a significant advantage, as designers possess multiple of the skills mentioned in the list, as they are within the nature of the job. Especially number 3, phrases such as “creativity, innovation, ideation, originality, and initiative”. Many of these skills can be regarded as characteristics of designers when considering design is regarded as a creative industry.

2.1. Creativity studies

Creativity is a topic that has been considered “hot” for a long time, and it is a crucial skill for designers. Successful designers not only possess specialised knowledge but are distinguished by their ability to think creatively (Tschimmel, 2022). In recent years, creativity has received significant attention from professionals and researchers, and the immense benefits it has to individuals and societies have led to significant attention from policy as well (Bereczki & Kárpáti, 2018). The growing interest in creativity is perhaps making it more complicated how to decide what is the best way to nurture creativity in the classroom (Kaufman & Beghetto, 2016).

Even though creativity has grown to become a topic with a large volume of articles, papers, books, and other publications in the past few decades, there is no universally agreed definition of creativity (Runco & Jaeger, 2012). There are different ways to define creativity. Even in the *Creativity Research Journal*, a well-established academic journal focusing on creativity, creativity is defined in nearly every article (Runco & Jaeger, 2012). Even though the value of creativity is widely recognised, there are still problems with defining creativity (Wilson & Zamberlan, 2017).

Nonetheless, a popular way to define creativity that is widely accepted is regarding creativity to possess two components, on the one hand, purposefulness (or appropriateness) and the other novelty (or originality) (Runco & Jaeger, 2012). Novelty is regarding ideas, especially generating new, different, or perhaps unique ideas. This particular aspect of novelty is that this thesis has a particular interest in the domain of creativity. As such, this thesis has been reviewing literature addressing creativity in the education context.

2.2. Design schools

Design is a discipline that has been practised for thousands of years however design education is a relatively recent phenomenon, showing a progression from the workplace to the university (Lawson, 2005, p. 6). Design schools started emerging only in the last few decades, with only a handful of institutions being older than a century. There are exceptions though, where design programs belong to art schools that go further back. For instance, the National School of Fine Arts (École des Beaux-Arts) in Paris, France, was founded in 1682 and is sometimes credited as the oldest fine arts school globally. Despite being an art school, it does have undergraduate design programs.

Perhaps the first-ever design school is the Royal College of Arts (RCA) in London, England. When founded in 1837, the Metropolitan School of Design was one of the first design schools. It was renamed again in 1863 and then once again in 1897. Finally, in 1897 it became the Royal College of Arts and has kept this title since then. The QS world rankings consider RCA as the world's best institution in their "arts and design" leader board, and it has consistently been ranking as number one, year after year. Even though it now bears the title of an art college, it started as a design school. Although art colleges and art schools are different from design schools, it can be argued by some measure that design schools existed since RCA was founded.

Perhaps another example of a world-leading design school can be the Rhode Island School of Design (RISD) in Providence, Rhode Island, USA. Currently, it is number four on the QS world rankings arts and design. RISD was founded in 1877 and has not changed its name since then. Arguably, it is one of the oldest design schools in the world. Design schools have been perhaps a significant contributor to the development of design as an industry. However, design, as an academic, scholarly discipline, is much newer compared to design schools. The first conference in doctoral education in design took place at Ohio State University in 1998 (Margolin, 2010), and since then, the number of PhD programs in design has been gradually increasing.

2.3. Knowledge area being addressed

Design education emerged relatively recently (Lawson, 2005, p. 6), not more than two centuries ago (as explained in section [2.2 on page 8](#)). As a specialised form of education, design education has been suggested to have diverse aims. Notwithstanding the variety of proposed aims of design education, it can be agreed upon that fostering creativity is a significant part of a good quality design education. Within creativity, the ability to generate ideas is a significant component and presumably is being developed throughout design education.

Emphasising design education, locating appropriate literature on the teaching strategies that foster and grow the ability to generate ideas has been challenging. Searching for this topic has not been fruitful, besides finding some fragmented literature across various disciplines that somewhat overlap. However, no specific publication or manuscript was found that addresses teaching strategies that affect the ability to generate ideas, specifically in the context of design education. The next section shows More information about what search strategies were deployed can be in the appendix [on page 333](#).

The lack of such literature suggests that the topic is not excessively explored. Moreover, other scholars have indicated that more research should be conducted on idea generation (Puccio & Cabra, 2012, p. 210), calling for future research inclined towards management and leadership, raising relevant questions for future research. For instance, which training approaches for idea generation would work best? What are the effective approaches that organizations can utilise to develop and vet promising ideas? With the searches on google scholar and oatad.org, it can be established that the topic in question is not been previously published. Additionally, with calls for future research by Puccio³ & Cabra, it becomes apparent that further research in the area of idea generation is recommended.

³ Gerard J. Puccio is the Department Chair and a Professor at the International Center for Studies in Creativity in Buffalo State, an exceptional department that offers a unique M.S. in creativity.

2.4. Research problem

This dissertation aims to explore educators' perceptions regarding idea generation, specifically in the design education context. This an important topic to address, considering the following:

- 1) No publication that is addressing the same (or very similar) research questions was identified (see section *Error! Reference source not found. Error! Bookmark not defined.*).
- 2) The literature appears to contain adequate (indirect) information to answer the research questions, although only partially. While studies examine creative thought (looking at knowledge structures, associations, and schemas), studies examining how various knowledge structures help for idea generation and creative problem-solving are limited (Proctor, 2014b, p. 58)
- 3) The search volume when combining 'improve idea generation' with 'design education' is rather low, and
- 4) Prabir Sarkar & Amaresh Chakrabarti have suggested that despite having many design models (such as Graham Wallas model of the creative process, the genereplore model and others), we still do not have a good understanding of how new ideas come to the mind of the designers. Understanding how designers generate ideas remains quite limited. It is not clear whether it is from experience, imagination, or both. (2017). Sarkar and Chakrabarti raise some questions for further exploration: Does knowledge play a part in generating ideas? If it does not, how can it be explained that experienced designers repeatedly generate appropriate solutions more rapidly than novice designers?
- 5) While there is some literature on improving the ability to generate ideas, it tends to be targeted to 'non-creative' areas⁴ such as business. This literature does not explicitly address design education, which has a different pedagogical setting.

⁴ Authors' note: there is no such thing as 'non-creative' areas. Every area or industry, no matter how stagnant or conservative it may be, at some point it was creative when it emerged to address a need. As humanity is progressing to new modes of working (such as online) and it must adapt to change, it is forced to be creative.

- 6) Creativity that involves idea generation is an essential and crucial skill that will be needed in the future (see section 2 Background on page 4).

While design schools, students, educators, governments, and industries strive to improve the (design) labour force, idea generation, which is a fundamental piece of any creative work, is not examined thoroughly. This dissertation aims to enrich the understanding of idea generation in design education. It employs both qualitative and quantitative approaches. The objective is to positively determine how design schools affect the students' ability to generate ideas and explore the educators' perceptions.

2.5. Previous research

It has not been possible to identify previous research that explicitly addresses the perceptions of design educators regarding how to improve the ability to generate ideas. Nonetheless, some relevant publications addressing idea generation in the design education context were identified. One study investigated creativity training in higher education by referencing theories from thinking habits, styles, motivation, psychology, and behaviour studies (Lau, 2009). More recently, (McGlashan, 2018) has been investigating pedagogical approaches to enhance ideation in a classroom by trialling a learning strategy with students aged between 12 and 18.

Another publication from 2005, titled '*Nurturing Students to Think Creatively in Design Education*' shares a similar scope to the present dissertation.

Nevertheless, it does not have a research methodology or attempt to answer any specific research questions. It is an opinion piece that does not dive into the topic any more than a journal paper's physical limitations – meaning not more than a few pages.

Mose Biskjaer et al. have devised an analytical framework that aims to improve understanding of the creativity methods used in design and then tested their framework on three design tools that are familiar to them. Creeger has worked on problematising within the context of design education and provides a toolset for students expected to bring new perspectives to problems through idea generation.

There are a couple of doctoral dissertations with related topics. Tarja-Kaarinaha Laamanen's thesis (Laamanen, 2016) investigated the conceptual and material premises for ideation in the design process. Even though this study did look at design education literature, education was not a significant factor in the study.

Another relevant dissertation is from Edward Appiah (2014), who examines ideation and pedagogy issues in graphic design education at a public university. De la Harpe has also worked in a similar area, investigating sociopsychological factors that can influence graphic design students' creative ability and proposed a range of cognitive strategies used in graphic design idea generation. The last two mentioned dissertations have been focusing explicitly on graphic design.

Table 1 (on this page) lists the publications mentioned above, and it describes what type of item each one is (dissertation or article). As none of the mentioned publications explicitly talk about educators' perceptions in idea generation (in the context of general⁵ design education), these publications are explored any further here. As a further reference, a summary of methodological or research approaches is provided in *Table 2 on page 13*. This table aims to explain the research nature of these publications promptly.

⁵ Regardless design sub-discipline.

Table 1. Earlier research

<i>Research</i>	<i>Title</i>	<i>Type</i>
<i>(Creeger, 2019)</i>	Design Problem Exploration	Master of Science
<i>(McGlashan, 2018)</i>	A pedagogic approach to enhance creative Ideation in classroom practice	Journal paper
<i>(Mose Biskjaer et al., 2017)</i>	Understanding Creativity Methods in Design	Conference paper
<i>(Laamanen, 2016)</i>	Generating and Transforming Representations in Design Ideation	Doctoral dissertation
<i>(Appiah, 2014)</i>	An Exploration of ICT for Graphic Design Education at a Public University: Issues of Ideation and Pedagogy	Doctoral dissertation
<i>(Lau, 2009)</i>	Creativity Training in Higher Design Education	Journal paper
<i>(De la Harpe, 2006)</i>	Cognitive and Behavioural Strategies for Fostering Creativity in Graphic Design Education	Doctoral dissertation
<i>(Rao & Lo, 2005)</i>	Nurturing Students to Think Creatively in Design Education	Conference paper

Table 2. Research approach and/or methodology on previous research

<i>Research</i>	<i>Research Approach and/or Methodology</i>
<i>(Creeger, 2019)</i>	Interpretive and social constructivist
<i>(McGlashan, 2018)</i>	Theoretical – synthesizing literature
<i>(Mose Biskjaer et al., 2017)</i>	Theoretical – synthesizing literature
<i>(Laamanen, 2016)</i>	Qualitative – Focused interviews
<i>(Appiah, 2014)</i>	Mixed methods – Using observations, documents & interviews
<i>(Lau, 2009)</i>	Theoretical – synthesizing literature
<i>(De la Harpe, 2006)</i>	Systematic Literature review
<i>(Rao & Lo, 2005)</i>	None – it is an opinion piece

2.6. Statement of purpose

A designer's education presumably fosters creative ability. Designers can be regarded as creative people as they are expected to develop ideas and envision solutions before the solutions get materialised. How does design education contribute to the growth of the ability to generate ideas? It is a question that is currently not so well understood or explained throughout published literature.

There are, however, publications that explain the design process and clarify the various phases of designing. The design process uses a particular set of steps and it is the key to teaching design (Vande Zande, 2017, p. 29). One popularised design process is the double diamond model. This model is suggested to have four phases: Discover, Define, Develop and Deliver (Kochanowska, Gagliardi, & with reference to Jonathan Ball, 2022) and can be seen in *Figure 1 on page 15*.

Discover is the first phase and it is about exploring possibilities and discovering user goals, needs, and motivations. This is a phase that diverges and widens, illustrating openness to inspiration and information.

Define is the second phase where designers examine the outcomes from the previous stage. Organising information, detecting patterns, and framing the design challenge is the core objective in this phase. It is a convergent phase where designers focus to refine their ideas.

Develop is the third stage and it involves creativity, experimenting, iterating, and testing. Designers use their understanding of the problem by using insights and information developed or collected from the previous phases. It is a divergent thinking phase where multiple solutions are being considered.

Deliver is the fourth and final phase, where designers use their inspiration and understanding from the previous phases to deliver a solution that is addressing the problem. This is a convergent phase that concludes the whole process of picking an idea and transforming it into a final deliverable.

Idea generation happens most typically in the divergent phases, especially at the very start of the design process. It is a crucial element of the design process, as it is better to start with a larger pool of ideas and move onwards. Reportedly, developing a large and diverse pool of ideas increases the potential for innovation (Daly, McKilligan, Leahy, & Seifert, 2019), therefore it is a crucial

Currently, it is not very clear what are the exact pedagogical approaches that are being used to foster the ability to generate ideas and how design pedagogy impacts students on a personal level. Despite the ever-growing body of design education literature, fostering idea generation as a research topic has been perhaps slow to grab attention.

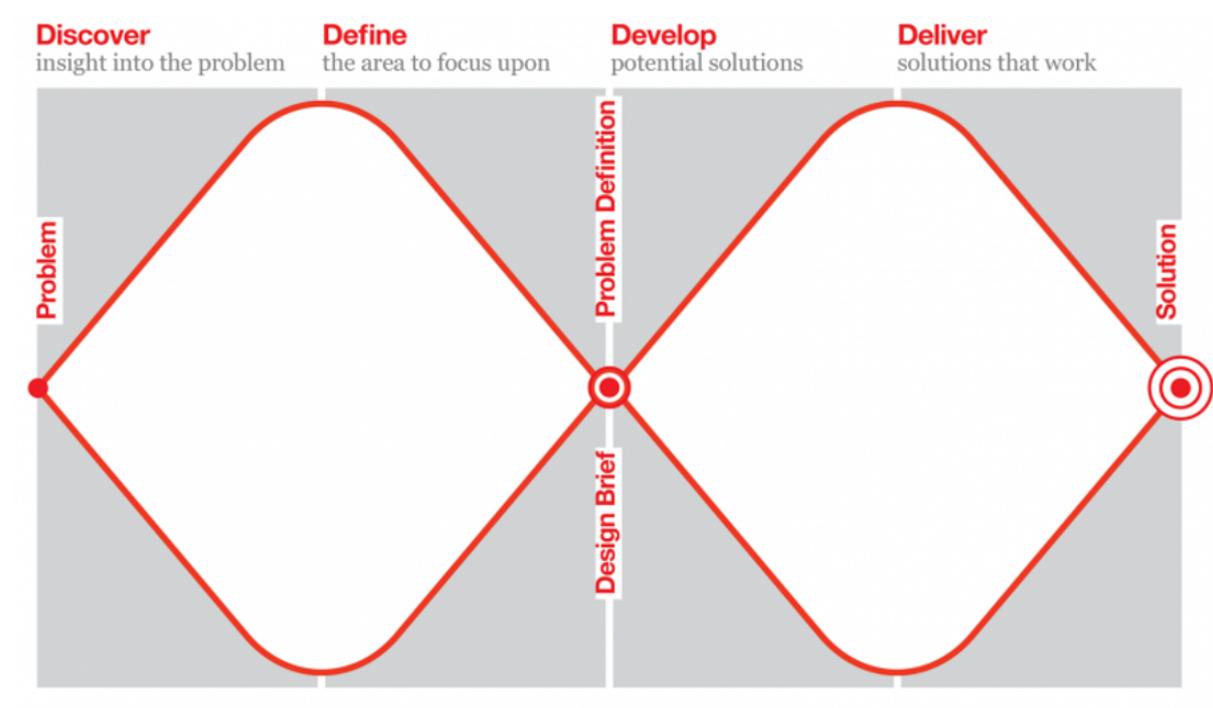


Figure 1. Double Diamond⁶

⁶ Source of the graphic: Lipiec, M. (2019, April 10). Beyond the Double Diamond: Thinking about a better design process model. Retrieved 6 January 2022, from Medium website: <https://uxdesign.cc/beyond-the-double-diamond-thinking-about-a-better-design-process-model-de4fdb902cf>

2.7. Why is this research current and relevant?

What are the teaching strategies being used in design school? How do they contribute to the ability to generate ideas? Such profound questions are worth exploring, and this thesis attempts to shed some light. Idea generation techniques are very well documented, both divergent and convergent thinking have an extensive body of literature and creativity literature has been exploding. Despite all this material, there is little written about the teaching strategies that design educators use to develop the students' ability to generate ideas, making this research current and relevant. There are various reasons why it is current and relevant:

1. The teaching strategies used to improve the ability to generate ideas are not well understood or documented. This study can help by providing a better understanding.
2. As there is an ongoing shift toward online learning, educators adapt their teaching approaches as a response to this change (Zeivots, Vallis, Raffaele, & Luca, 2021) and have a better understanding of teaching strategies can provide the grounds for a more suitable response.
3. Creativity (including the ability to generate ideas) is considered one of the future's major skills (*section 2.1 on page 7*)
4. Despite the focus on design education, the results of this study are transferable to other areas, such as (but not limited to) technology, business, entrepreneurship, HCI⁷, sciences and more.
5. While there is an enormous interest in the areas mentioned above, especially in areas such as creativity and divergent thinking, this research is going to contribute a novel perspective that can be useful for these areas as well.

⁷ Human Computer Interaction

2.8. Significance and purpose

This dissertation has three purposes (which can also be considered goals). There is a primary goal, an intellectual goal, and a researcher goal as a new and emerging scholar. The primary goal is to identify what teaching strategies are being used in design education to foster the ability to generate ideas. The intellectual goal is to provide an original, authentic view of the teaching strategies. The researcher's goal is to contribute original knowledge to the growing body of literature on the design education domain.

There are various beneficiaries of this research, and each one can benefit differently.

1. Design students.

Learners can indirectly benefit by having educators who are more aware and better equipped with a deeper understanding of how to foster the ability to generate ideas.

2. Design educators

Educators can benefit from having an enhanced understanding and awareness of what teaching strategies can be used in their classrooms.

3. Design Institutions

Universities and institutions can benefit indirectly through their faculty, the design educators who are more aware of the subject matter.

4. Design education scholars

As idea generation in design education is still a largely unexplored topic, this dissertation can benefit them by becoming a reference point.

5. The researcher

The pursuit of this PhD project has been a bittersweet journey that helps me transform and become a scholar.

There may be some more, not obvious, remote beneficiaries who also may receive some benefit.

6. *Design industry*

The industry can benefit by hiring more competent and competitive designers with an improved ability to generate ideas.

7. *Other sectors, such as business, engineering, or HCI (human-computer interaction).*

The corporate world and engineering sector need creativity and rely on people who come up with innovative solutions to various problems. The teaching strategies identified in this PhD might be transferable.

This study aims to provide a unique perspective on the topic, enhance the body of knowledge, improve the research literature, and contribute to this knowledge domain. More specifically, (as explained in the following chapters), the dissertation attempts to enhance the understanding of how to foster the ability to generate ideas by exploring teaching strategies being used by educators while investigating personality traits (traits affecting the ability to generate ideas).

Additionally, a match between personality traits and teaching strategies is being proposed. The body of knowledge addressing creativity has been growing steadily over the past few decades. Considering that creativity is often described to contain two components, purposefulness and novelty, novelty is the production (or generating) of ideas. The creativity literature that focuses on novelty is a significant contributor to this thesis, and this thesis aims to be an extension of this body.

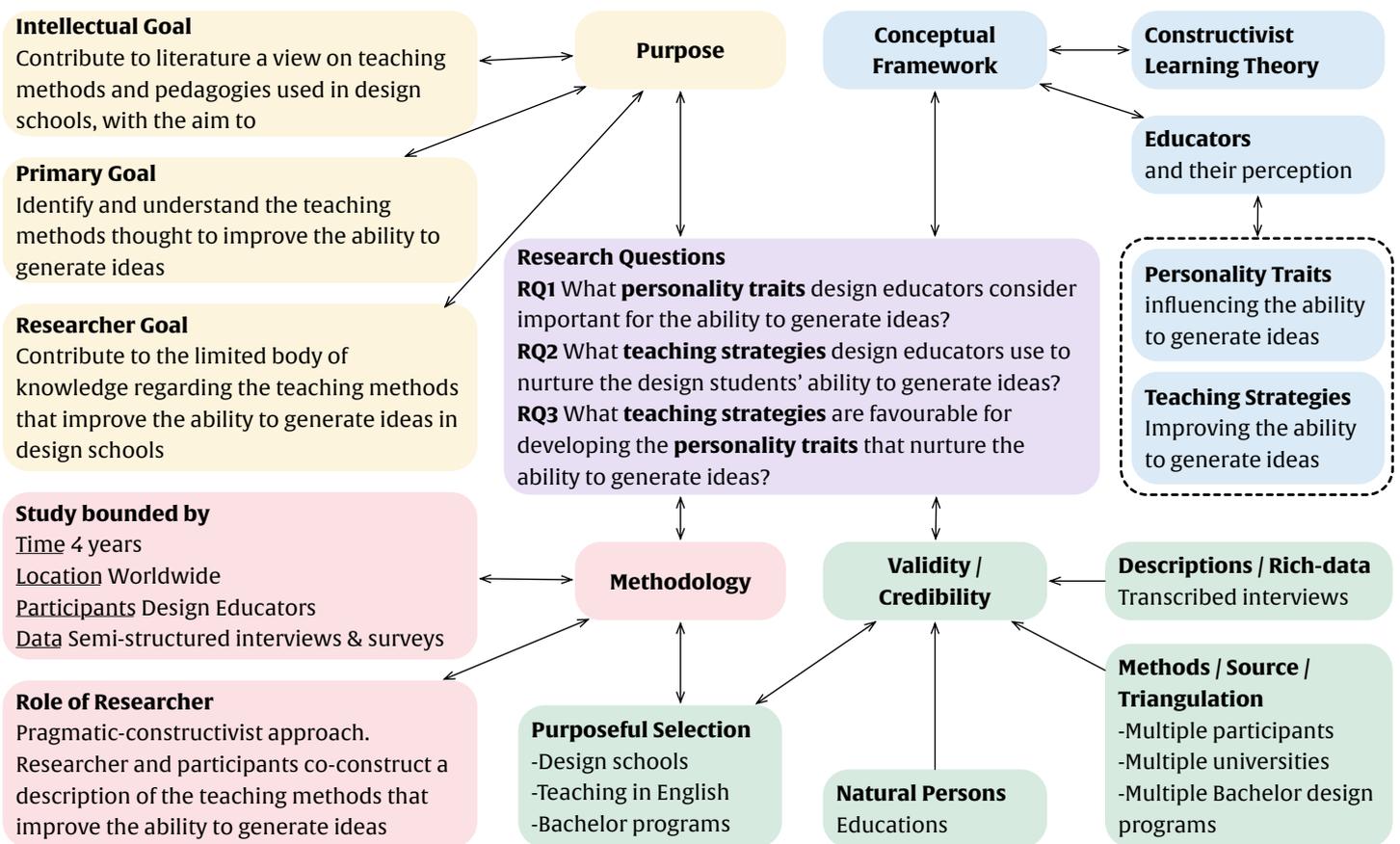


Figure 2 Methodological map

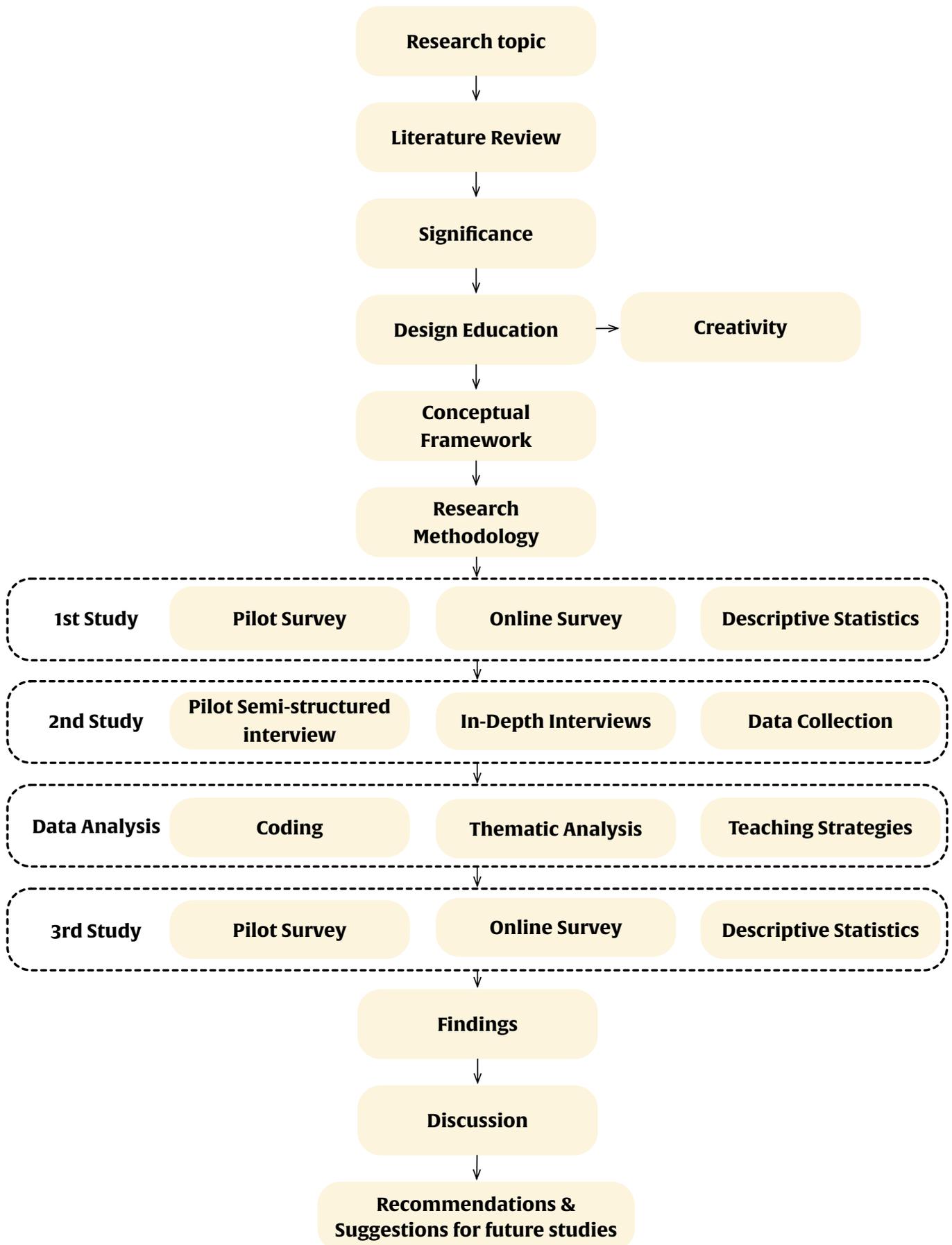


Figure 3. Methodological diagram

2.9. Research paradigm

The research paradigm in this dissertation is constructivism. It is a paradigm that assumes that reality is socially constructed. It means that individuals develop and create their subjective meaning of the world based on their personal experiences. According to Jonassen, humans are both perceivers and interpreters, constructing their own version of reality (1991). This approach gives room for multiple interpretations and multiple meanings (Bloomberg, 2019, p. 103). According to Tracie Costantino (2008), constructivism indicates a change from the focus on explaining phenomena (*Erklärung*) to an emphasis on understanding (*Verstehen*). Explaining phenomena (*Erklärung*) is typical in natural sciences. However, understanding (*Verstehen*) deems more appropriate for investigating phenomena in the human sciences (Costantino, 2008).

Constructivism is a suitable research paradigm for this thesis. Firstly, this PhD is about understanding (*Verstehen*) the teaching methods and pedagogies that improve the ability to generate ideas. Understanding this context refers to empathetic understanding, a method especially suited for the social sciences (Lindlof, 2008). This PhD, having a focus on education, does belong to the realm of the social sciences. Secondly, there is an emphasis on individuals (especially learners) to develop interpretations of their own in constructivism. It means the educator has a role that signifies less of a teacher and more of a facilitator (Weller, 2011, p. 92). As the instructors are 'enablers'

3. Research questions

The following research questions have been formulated. These questions are the guiding mechanism that was put in place to investigate the topic in depth. They do help discover, create, and contribute authentic and original knowledge. The questions' sequence follows the research design structure (*Figure 3 on page 20*). Each research question was addressed with a separate study, and each study contributed information needed for the next question. Despite this sequential order, it cannot be argued that the last question is the most important. All questions are equally important, and each question offers a significant contribution to the domain.

The research questions being raised are the following:

1. What **personality traits** design educators consider important for the ability to generate ideas?

According to the design educators' perceptions, this question attempts to identify the characteristics of a person (the person being the design student).

2. What **teaching strategies** design educators use to nurture the design students' ability to generate ideas?

This question attempts to identify the various teaching strategies used throughout the multiple branches of design education, in order to foster the ability to generate ideas.

3. What **teaching strategies** are favourable for developing the **personality traits** that nurture the ability to generate ideas?

This question attempts to demonstrate the connection between the personality traits (identified from research question 1) and teaching strategies (identified from research question 2).

4. Literature review

The literature review in this dissertation is conducted through a so-called *traditional literature review*. This means the review aims to provide an overview of a research field (Hempel, 2020) covering the research area of idea generation in design education. It also aims to explore pedagogical aspects as well. All the included material was carefully and deliberately selected with a series of methodical decisions (as explained throughout the following few pages). The general scope of the present literature review is to deliver an overview of the relevant research areas, contributing to the theoretical basis that builds the conceptual framework.

To conduct this research several publications have been looked at, the two core bodies being design education and creativity. Creativity research has a foundation in psychology, which lead to relevant literature about personality traits. The search strategies that were deployed helped to identify specific literature about creativity personality traits for educators. This literature is being to construct the conceptual framework of the thesis.

Interested readers can read about the search strategies being used in the appendix on page 333. Some information regarding the literature's characteristics can be seen in Table 86 on page 330 such as what type of literature was considered or excluded. Table 87 on page 331 provides information regarding the sources that were used.

4.1 Purpose of the literature study

When researchers conduct literature reviews, they critically read and make connections, integrate, and synthesize presently published work related to the research topic (Ravitch, 2017, p. 31). The literature review attempts to dissect the intended research topic into components and then synthesise and integrate them into a conceptual framework (section 6.1 on page 79). This study was planned methodically and conducted as described in the previous section. There is no single purpose. Instead, there are multiple reasons why the literature review is necessary. The purpose of this review is multi-faceted:

- a) To learn how other researchers have defined, measured, and talk about key concepts,
- b) To observe, familiarise and learn about past, relevant research,
- c) To discover what has not been investigated and examine if there is sufficient knowledge (section 2.5 on page 11),
- d) To discover possible avenues for future research,
- e) To provide evidence to support the findings of this study,
- f) To contribute to the field by establishing a map,
- g) To collect the relevant knowledge to formulate a conceptual framework, which will be used to address the research questions.

4.2 Mapping the literature

It is easy to become overwhelmed by the sheer volume of available literature. The domain of creativity and primarily the domain of education could be considered enormous if a domain were to (supposedly) include all published materials related to these domains.

As such, the boundaries of the literature for this study had to be determined. Identifying the essential literature bodies and the relevant and useful (but not essential) literature help stay in focus and avoid irrelevant or unrelated literature. For this purpose, developing an Areas of Relevance and Contribution diagram, also known as ARC-Diagram, (Blessing & Chakrabarti, 2009b, p. 66), is quite helpful. *Figure 4* on this page provides a visual overview.

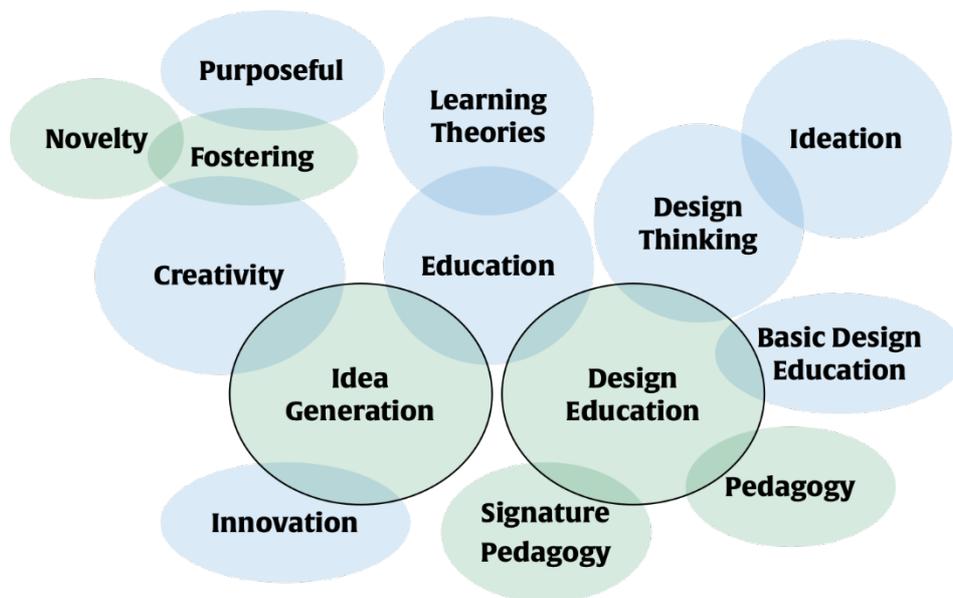


Figure 4. Areas of Relevance and Contribution Diagram

4.3 Operational definitions

Table 3. Summary of key terms

<i>Key Term</i>	<i>Summary</i>
<i>Ability</i>	The capacity or potential to do something.
<i>Basic Design Education</i>	The teaching and learning of design fundamentals
<i>Constructivism</i>	It is an approach to learning which holds the view that people construct their own knowledge.
<i>Design</i>	An industry domain that is about solving problems or improving situations
<i>Design education</i>	The pedagogical processes that facilitate the transformation from a novice, amateur designer into a graduate, professionally competent designer
<i>Design pedagogy</i>	The method or practice of teaching design disciplines
<i>Education</i>	The enlightening process of receiving systematic instruction
<i>Educator</i>	Educational instructor. The person who delivers classes.
<i>Idea</i>	It is a thought or suggestion to take a possible course of action.
<i>Idea generation</i>	the act or process of forming ideas. It is a creative process and can be done by a single person or by a group of people.
<i>Idea generation ability</i>	The ability to generate ideas
<i>Idea generation skill</i>	The ability to generate ideas very well and with ease
<i>Ideation</i>	It is a process that involves starting with idea generation and selecting or filtering the best ideas afterwards.
<i>Knowledge</i>	Facts, information, and skills acquired through education or experience
<i>Learner</i>	A learner is a person (student) who tries to find out about a subject, e.g., Design.
<i>Learning theory</i>	A theory that describes how students learn.
<i>Literature</i>	A body with written academically published work. This body of work is considered to have a prolonged effect
<i>Skill</i>	the ability to do something very well, so well that a person can stand out from the general population (for example, everyone can run -that is an ability- but few can run marathons -that is a skill-).
<i>Student</i>	A person who is studying or learning at a higher education institution
<i>Pedagogy</i>	The method or practice of teaching
<i>Teaching</i>	The action of delivering content to students or the act of creating the learning conditions/environment where students grow
<i>Teaching method</i>	A specific technique to deliver content to students or create learning conditions/environments where students grow.
<i>Teaching strategy</i>	Teaching methods that educators and teachers use in their classroom to have a specific impact/effect on their students (preferably long-term impact).
<i>Teacher</i>	Same as an educator, an educational instructor. As teachers sometimes are associated with non-adult students, the term educator is preferred in this thesis

5. Idea generation in design education

Idea generation is only one of the activities that design students are engaged with. Throughout design education, students produce a body of work that demonstrates a range of designer qualities. These are how students respond to design briefs, work independently and collaboratively, and more. One of the qualities is the ability to generate ideas (Makhoul & Morley, 2014).

As this study's topic addresses the perceptions of idea generation by design educators, it is worth elaborating on what design is and how it is being taught. It is also worthwhile to address what idea generation is. Upon breaking down each core component concept, the following can be briefly addressed, one by one.

<i>Question</i>	<i>Section</i>	<i>Page</i>
<i>What... ...is an idea?</i>	<i>5.1</i>	<i>28</i>
<i>...is idea generation?</i>	<i>5.3</i>	<i>30</i>
<i>...are idea generation techniques?</i>	<i>5.4</i>	<i>31</i>
<i>...is the nature of ideas?</i>	<i>5.2</i>	<i>29</i>
<i>...is design?</i>	<i>5.6</i>	<i>34</i>
<i>...is education?</i>	<i>5.7</i>	<i>37</i>
<i>...is design education?</i>	<i>5.8</i>	<i>45</i>

5.1 What is an idea?

Simply put, an idea is a possibility. It is a potential course of action, something that can happen. It is also the content of a concept or a belief. From some perspectives, it can be argued that humans owe their way of living and present existence to ideas. The survival of humanity was constructed and relied on human imagination, and everything that humans ever created was once an idea in someone's mind.

Nations are founded on ideas; civilisations have flourished or been destroyed because of ideas (Graham, 2004). Ideas are something that everybody has throughout their lives, and it is not unique to a specific industry, nation, or type of person. Designers generate ideas in their work line, and so do lawyers, chefs, builders, farmers, mechanics, mathematicians, dancers, and educators. Practically any profession requires idea generation, in one way or another and at some point, as any profession evolves and progresses.

Considering that ideas are a crucial component of creativity, it can be argued that even animals have ideas. Lately, there has been a growing body of research on the creativity of animals. As animals adapt to the ever-changing landscape of their environment, it could be argued that they are engaged in idea generation too. For the time being, much animal creativity research focuses on the serendipitous nature of creativity. Perhaps future research will investigate the idea generation skills of animals.

5.2 What is the nature of ideas?

The book 'Where Good Ideas Come from: The Natural History of Innovation' makes a compelling argument about ideas. As time progresses, ideas are repurposed, developed and refined further and given new meanings and new context (Johnson, 2010). For example, Tim Berners-Lee, a British computer scientist, created the World Wide Web as a tool for academics and scholars. However, over time it has evolved past its original inception. Now the World Wide Web has become a place that "you can go to" for shopping, social media, and entertainment. More recently, as the Covid-19 pandemic is unfolding at the time of writing, the World Wide Web has become the actual workplace for more people than ever before. Many universities (and design schools) were forced to quickly modify their operations and start delivering their courses online as a measure to contain exposure to the virus. As of March 25th 2020, about 150 countries had nationwide schools and educational institution closures, with over 80% of the world's student population being impacted (Sahu, 2020), giving a new meaning to the World Wide Web.

As Steven Johnson elaborates, ideas are building upon other ideas. For example, as the World Wide Web has transformed in such a way since the beginning, it required specific ideas to be in places such as electricity and connectivity. Today the World Wide Web is widely accessible through smartphones. Smartphones require other ideas, such as wireless connectivity, battery technology and touchscreen technology. These technologies might have existed before the World Wide Web was created. However, they did become mature only recently in the past few decades. Similarly, Johannes Gutenberg, around the year 1440, reused the winepress and combined it with his knowledge of metallurgy and invented the printing press. The wine press at the time was a 1000-year-old invention. Evolutionary biologists use a term called *exaptation* to describe some evolutionary phenomena when traits or features developed for a specific purpose, eventually utilised in another, different way. In that sense, there is an "organic" nature to ideas.

5.3 What is idea generation?

Humans have been using their extraordinary capacity to find novel solutions to newly emerging problems -creative problem solving- to succeed on a continually changing planet (D. H. Croyley, 2019). Throughout this process, numerous ideas are generated. Idea generation is the capacity to respond to a problem or situation and produce ideas (that could or could not solve the problem) is idea generation.

Solving problems is not as simple as generating ideas. Idea generation is just one piece of the puzzle (Treffinger, 2000). In the design context, any design process involves an idea generation stage and conceptual analysis (Erlhoff & Marshall, 2008, p. 74). Idea generation is the initial point where various solutions will be suggested, and a range of options will be put on the table. The process of starting the idea generation is not always straightforward. It is not like the switch of a button. Instead, it is a continual activity like an addictive journey for the inquiring mind (Bramston, 2016). In the design process, idea generation typically occurs in convergent phases (as explained [on page 14](#)), and it involves discovering user goals, needs, and motivations, resulting in more 'appropriate' ideas.

The goal of creativity (or any creative process) is to suggest novel and valuable ideas. (Runco, 2003; Sternberg & Lubart, 1996). However, idea generation alone aims to come up with as many novel ideas as possible (Werner & Tang, 2017). Whether these novel ideas are strong, feasible, sound, or suitable is not relevant at this stage, decided later. Alex F. Osborn has argued that quantity breeds quality (Osborn, 2001), and as such, the simple objective is to generate many ideas. Alex F. Osborn is also famous for popularising "brainstorming" through the 1953 book 'Applied Imagination'. Brainstorming is a prevalent technique for generating ideas. However, despite its popularity, there are many more idea generation techniques and several books that provide numerous idea generation techniques and methods, as explained in the next section.

5.4 What are idea generation techniques?

As mentioned in the previous section, brainstorming is a popular technique for generating a large volume of ideas in short periods, popularised by Alex F. Osborn. It is a technique-driven facilitator who encourages the participants creatively, refrains from the ideas' judgment, and stays focused. Brainstorming is perhaps one of the most popular idea generation techniques. However, it is not the only one.

There are many more techniques providing numerous angles and approaches, of which some of them are nearly identical to others but with a slight twist. For example, another brainstorming technique called “negative brainstorming” shares the same core principle as brainstorming. However, the objective is to identify as many problems and issues as possible. Then, when there is a compiled list of problems, the problems are examined. Participants consider options and ways to reverse any of these problems, resulting in a productive outcome or solving the problems (Cryer, 2006).

There are many more idea generation techniques. The plethora of techniques has caught the attention of some scholars. G. F. Smith (1998) has published an article titled “*Idea-Generation Techniques, a Formulary of Active Ingredients*”, in which 172 idea-generation methods were analysed and grouped. Arthur B. VanGundy (1946-2009) is another author who spent his career on idea generation techniques and is internationally known as an expert in the field. He authored books such as “*101 Activities For Teaching Creativity And Problem Solving*” (2005). Another book by the same author, “*Techniques Of Structured Problem Solving*” (1988), has at least 61 idea generation techniques, aside from other techniques for refining problems, evaluating, analysing implementing ideas and other miscellaneous techniques. VanGundy himself has claimed that at least two hundred idea generation methods can be used by individuals and groups (2007, p. xv).

There have been institutions invested in studying and researching idea generation. Early in the 1970s in Germany at the Batelle Institute, a team of consultants launched the first comprehensive creativity research in Europe, known as Methods and Organization of Idea Generation (Gesellschaft für Kreativität). Some of the project aims were to compile a list with all idea generation methods worldwide, analyse the idea generation methods for their underlying principles, and test the application of the idea generation methods in the daily life (Preiser, 2006, p. 194).

People have many ways to generate ideas (G. F. Smith, 1998) and are not restricted to only one method or technique. Design schools often introduce many of these techniques to students, familiarising themselves, and experimenting with them. (Lawson & Dorst, 2009) explains that as designers gradually acquire attitudes and interests in their work, they also receive a set of knowledge in the process. The ways to approach problems and the idea generation techniques involved can be considered part of the design knowledge.

While using the idea generation techniques in education is a major, significant part in facilitating the conditions that improve the ability to generate ideas, this dissertation does not focus on these techniques. Instead, it focuses on the personality traits that affect the growth of the ability to generate ideas.

5.5 Ideation vs idea generation

Idea generation and ideation are often confused and interchangeably used with many scholars' same meaning. Some scholars, (e.g. Daly et al., 2016; Dorta et al., 2008; Pang, 2015), are talking about ideation and use both terms interchangeably. These two concepts should not be confused, as confusing them can be problematic when exploring the literature. Further attention is required to how the terms are being used (especially ideation) to make sense of them and comprehend the intended meaning.

Wrigley & Straker, (2017) have suggested a pedagogical tool for teaching Design Thinking (shown in [Table 85 on page 329](#)) based on Bigg's SOLO⁸ taxonomy. In this tool, ideation and idea generation are shown separately in various stages. Ideation is mentioned in the first stage, and idea generation is mentioned in the first and second stages. However, no explanation is provided on how these two terms differ. Despite the lack of clarity, the fact that they use both terms, means Wrigley & Straker do acknowledge they are not identical.

In the light of the confusing and unclear situation between idea generation and ideation, this dissertation adopts the terms defined by the 2018 book '*This Is Service Design Doing: Applying Service Design Thinking in the Real World*' (Stickdorn et al., 2018). According to this book, ideation is an iterative process that goes through non-linear phases. Depending on the situation, the process can enter a loop and reiterate. Idea generation is one of the two phases of ideation. The first phase, *idea generation*, is exploratory and divergent, and it aims to produce as many novel ideas as possible (Werner & Tang, 2017). The next phase, *idea selection*, is where people decide on the ideas that they consider the strongest. This decision is typically made through a vetting or elimination process.

⁸ SOLO stands for 'Structured of the Observed Learning Outcome'.

5.6 What is design?

(1) *Design is (nearly) everywhere, and,*
(2) *humans engage in design every day.*
(Vande Zande, 2017)

Design is generally accepted as a (relatively) recent profession and even more recent field (Tonkinwise, 2017). All of the people who practice, teach or do research in design have an intuitive sense of design, but disputes may arise as definitions can vary across other disciplines (Salustri & Eng, 2007). Regardless of how design is designed and how it came about, how far back can we find historical design examples?

Depending on how one might approach it, even when humans learned to control fire, they pursued design. Harold G. Nelson and Erik Stolterman have argued that humans did not discover fire. Instead, they “designed” it. The wheel was also not a product of luck but the result of design. According to Nelson, there is a habit of describing significant human achievements as “discoveries” rather than “designs” (Stolterman & Nelson, 2012). Design can even be considered -somewhat of- a synonym for discovery (depending on the context).

Many definitions describe what design is (Blessing & Chakrabarti, 2009a). Even the word “design” varies in meaning and linguistic function. John Heskett emphasises wordplay in which “*Design is when designers design a design to produce a design*”. In this sentence, design is interchangeably used with a different meaning at each time. Design can be a verb and a noun in the same sentence, like Heskett’s example. It can be challenging when non-designers (e.g. clients or the public) are not sure of the exact meaning that is meant to be conveyed. Even design professionals are moving seamlessly from one meaning to another without distinguishing or clarifying the same meaning they refer to at each time (Heskett, 2001).

Nelson and Stolterman (2012, p. 21) define design as “*the ability to imagine that which-does-not-yet-exist, to make it appear in concrete form as new, purposeful addition to the real world*”, sounds like design is closely related to creativity and imagination. Victor Papanek (1923-1998), an influential design educator, claimed that design is an activity that is basic to humanity. To him, design ranges from is composing an epic poem and painting a masterpiece to cleaning a desk drawer or educating a child. “*Design is the conscious and intuitive effort to impose meaningful order*” (1972, p. 4).

Design is also considered a process. For instance, Jay Doblin provides a simple model to describe design, called SPS (state-process-state) (Doblin, 1987). According to this model, the initial stage (the current situation) gets transformed through a “process” to achieve a future state (the desired situation). Some other scholars see design being a bridge between the arts and science and liberal and servile arts. As such, design can be a universal educational constant that can move fluidly across disciplines and boundaries to pursue and create new opportunities (Barba, 2015). Charles Owen (2004) described design being “*a profession, that is concerned with the creation of products, systems, people’s lives and do all of this with respect for the welfare of the natural environment*”.

The examples provided above are only a small selection of the broad range of meanings people associate with design. Many different definitions are available. Vladimir Hubka (1996) has gathered a diverse set of design definitions from multiple perspectives. Design can be many things; it can be a process; it can be an ability; it is also a profession or an activity. One common feature in many definitions is a reference to a “future state”. Design ought to shift a situation to a better or improved state, meaning it is time dependent. Interestingly, design has changed and evolved over time. Buchanan’s notion of the Four Orders of Design suggests that design (as a whole) has matured over time as many disciplines grew in the past century (Buchanan, 2001) while several design disciplines have emerged (and continue to do so). It is well

known that there is a vast array of design disciplines. Discipline, in this case, means a specialisation. There are many specialised designer types. Designers can range from design engineer, graphic designer, fashion designer, interior designer, industrial designer and many more (Tovey, 2015a).

Some design types are so large that they even have subcategories. For instance, automotive designers, product designers, and even smaller groups like boat designers are all working within the design domain of the industrial design (Tovey, 2015a). All types of designers require some learnable abilities and (soft) skills essential, regardless of their specialisation (Porten, 2008). There are prominent historical figures that pursued design throughout their career. However, they are not being described as such. Possibly because design is considered a (relatively) new discipline (Tonkinwise, 2017), even though it is being practised for centuries.

One of these prominent historical figures is Leonardo da Vinci (1452-1519). Da Vinci has been described as a scientist or an artist. He had a practical, purpose-driven, and integrative approach to the world, and his essential nature was the nature of a designer (Stolterman & Nelson, 2012). These are skills that make a designer, including keen observation, a high level of tolerance for frustration, proficiency in writing, communication to present ideas effectively, empathy, diplomacy, and more (Porten, 2008), which da Vinci seemingly possessed.

Besides requiring soft skills, design professionals also share some common characteristics, such as creative exploration. Creative exploration is an attribute that spans various design disciplines (Adams et al., 2011). This characteristic may entail experimenting with ideas that have loosely defined endpoints, embracing risks coming from exploring the unknown; willing to try new things and thinking further beyond expected outcomes (ibid). Creative exploration does entail idea generation, too, through the explorative process.

5.7 What is education?

Typically, education is supposed to teach, train, and learn to develop skills and improve knowledge, especially in institutions like schools, colleges, and universities⁹. However, it has been argued that education is not limited to developing skills, improving knowledge, and learning techniques. Education “*is preparation for life-long learning that intellectually cultivates the capabilities of the mind. to encounter new situations and respond with imagination, ingenuity and creativity*” (Frascara, 2020)

Education happens everywhere and takes many forms and shapes. It certainly is not confined only to humans, as animals also have teachable moments, such as meerkats teaching their pups about the dangers of scorpions (their primary prey). Their teaching method involves demonstrating to young meerkat learners a progressive difficulty level, starting from familiarising themselves with dead scorpions. The “instructor” will bring injured scorpions until they finally move into a specimen in nature, outside the “class”, in the real world. Education for humans is much more complex, and it entails many parameters. Perhaps it goes as back as prehistory when societies were pre-literate. However, education offered at that time would be considered “informal” from a contemporary perspective. Besides “Informal”, two more forms of education have been suggested “formal” and “non-formal” (Dib, 1988; Tudor, 2013).

Formal education is offered by educational institutions (for instance, schools, universities, and colleges), and education is well structured, and usually, a degree or a qualification will be provided upon completion. Attending compulsory education (elementary, high school) or a university degree program would be good examples. Non-formal education is offered intentionally by a supplier (from educational institutions such as schools, academies, or other official or semi-official organisations). However, it is not as

⁹ 10th edition, Hornby, Albert S., Diana Lea, and Jennifer Bradbery. *Oxford Advanced Learner's Dictionary of current English*. Oxford: Oxford University Press, 2020. App.

strictly structured as formal education while maintaining some structure. Learners pursue it for different reasons than getting accredited. For example, attending library workshops or doing non-credit extra-curricular classes could be examples of non-formal education.

Informal education is unintentional learning outside a well-planned and organised education context—for example, kids become native speakers by listening to others or learning how to use a computer without anyone’s help. This form of education, this way of learning, is probably the most common way among adults (Tudor, 2013). *Table 4 below* shows a synoptic view of the different forms of education, along with examples.

Table 4. Forms of Education

<i>Type</i>	<i>Structured</i>	<i>Example</i>
<i>Formal Education</i>	Yes	<i>A university degree program.</i>
<i>Non-Formal Education</i>	Somewhat	<i>Watching YouTube videos to supplement formal education</i>
<i>Informal Education</i>	No	<i>A kid learning their native language through osmosis</i>

As mentioned above, informal education (probably) has existed since prehistory. In terms of formal education, the earliest known case of institutionalised higher education would be in Ancient Greece. In that era, the Mouseion of Alexandria (which included the library of Alexandria) was considered one of the world's first research institutions around 300 BC. Although higher education institutions have existed for more than thousands of years, their number and types have risen substantially in the past six decades. In 1945 there were 500 universities across the globe, and today there are more than 10,000 universities (The Economist Intelligence Unit, 2020). Even though the global population has increased¹⁰, the universities' growth has outpaced population growth. Especially considering that access to education has improved globally, more people are attending universities now than then.

¹⁰ 2.5 billion in 1950, and nearly 7.8 billion in 2020. Source: World Population by Year - Worldometer. <https://www.worldometers.info/world-population/world-population-by-year>. Accessed 16 May 2021.

5.7.1. What are the aims of education?

A question that philosophers and educators have explored regards the meaning or aims of education. What are the aims of education? Even John Dewey, the prolific writer and educator, has provided a range of responses to the question, making his formulations of ideal education aims enigmatic to both supporters and critics (Mintz, 2017). It could be said, as such, that defining the aims of education has varied over time. Cohen has argued that the aims of the National Curriculum in the UK are to promote decision-making and flexibility and produce adaptable and resourceful citizens, which contradicts the conformity and standardisation of the education provided, hence cancelling the aims of education (Cohen, 2010).

Thompson pointed out that New Zealand and the United States have nearly identical education aims. These are learning to learn, lifelong learning, and the knowledge economy's cultivation with a student-centred pedagogy. Even though these countries have nearly identical aims, they function quite differently on education policy and management level (Thompson, 2018). The examples mentioned above illustrate each country's education goals at the national level specified by their respective government bodies. While both education systems may aim at the learners' betterment, the aims are quite different. Therefore education aims are not universal; they differ from place to place and institution to institution.

Careful consideration and informed discussion are needed on the education aim in all institutions dedicated to advancing the learning (Ireson et al., 1999). The pupils' motivation should also be considered, as, without motivation from the pupils, learning cannot take place (Hallam & Ireson, 1999). The Economist Intelligence Unit (EIU)¹¹ emphasises that institutions must address different stakeholders, of which each has different goals (*Table 5 on page 40*)

¹¹ The Economist Intelligence Unit (EIU) is a London based research and analysis division of the Economist Group, providing advisory services and forecasting.

For example, governments expect universities to be a source of research and innovation. Cities look at universities to revitalise local neighbourhoods. The industry wants universities to produce a well-trained labour force (The Economist Intelligence Unit, 2020). Overall, different stakeholders demand and expect different outcomes from universities.

As the EIU reports, universities must address these issues to stay competitive and relevant. All these different goals from the various stakeholders are adding pressure on universities. It is forecasted that addressing these competing demands will become even more challenging as universities will deal with systemic generational challenges, such as automation or declining public funding (ibid).

Table 5. High education caters to many stakeholders with different goals

<i>Stakeholders</i>	<i>Goals</i>
<i>Students and parents</i>	<i>Employment</i>
	<i>Avenue to Explore academic interests</i>
	<i>Path to adulthood</i>
<i>Public sector</i>	<i>Independence</i>
	<i>Source of a well-trained labour force</i>
	<i>Source of research and innovation</i>
	<i>Training of enlightened and responsible citizens</i>
	<i>A positive regional economic impact</i>
<i>Private sector</i>	<i>Foster commitment to the common good and social cohesion</i>
	<i>Source of a well-trained labour force</i>
	<i>Source of research and innovation</i>

Source: (The Economist Intelligence Unit, 2020).

5.7.2. Schools of thought & learning theories

There are (primary) schools of thought (also known as learning theories) about the learning (Fairbanks, 2021). These are the behaviourist, cognitivist, constructivist, humanist, and social theory of learning¹². These theories - somewhat- overlap and are interrelated (Guild, 1997; Lucas, 2005). Nevertheless, each does have some qualities that make them different (Lucas, 2005). Each theory is very briefly discussed with a few words.

Behaviourist theory of learning

This theory believes that learning takes place as a reaction to changes in the learner's environment. A famous example often used is an experiment that Ivan Pavlov conducted. Pavlov successfully taught dogs to change their behaviour; upon training them that a doorbell rang, and food was offered. When eventually the doorbell rang without or without a food offer, the dogs had learned to salivate or drool, nonetheless. That means the behaviour of the dogs had changed due to changes in a controlled environment.

Cognitivist theory of learning

The key to this theory is that learning occurs due to internal thought processes, lying in cognitive psychology. Cognitivists looked beyond behaviour and considered short term and long-term memory to be additional factors in learning.

Humanist theory of learning

In this theory, there is a belief that learning happens best when learners are safe, confident, empowered and assured. Virtually there is unlimited room for growth and potential for every learner, and the goal of learning is self-fulfilment. Abraham Maslow, famous for the Maslow's hierarchy of needs, is a crucial advocate.

¹² Sometimes cognitive neuroscience is seen as a learning theory, even though it is a scientific principle.

Social theory of learning

According to this theory, new behaviours and learning happen by observing and imitating others. Interactivity with others is required for learning to take place. Also, observing rewards and punishments is considered part of the learning process.

Constructivist theory of learning

Constructivism is a theory that comes from various perspectives. This theory's central idea is that individual learners construct much of what they learn and understand it themselves. There is no absolute knowledge, as knowledge is relative to the learner's perspective. Constructivist perspectives differ in the sense of the process of construction. There are various approaches, for instance, *social, radical, or exogenous constructivism*.

These are some of the most popular schools of thought regarding the philosophical stance of learning theories, which can help educators make informed decisions about their teaching based on their preferred teaching approach. The five learning theories mentioned above are popular among the many well-documented and well-discussed theories in the education literature. Besides these learning theories, there are also newly emerging theories. The teaching environment is changing and gradually advancing in new circumstances, making the five theories mentioned above only a tiny fraction of the available theories. If one were to distinguish teaching delivery methods (such as problem-based learning) and schools of thought (such as behaviourism), the list of learning theories would grow even more considerably¹³.

¹³ Interested readers who want to explore more about learning theories can explore diagram offered by Richard Millwood, an education scholar, at the following link <http://hotel-project.eu/sites/default/files/hotel/default/content-files/documentation/Learning-Theory.pdf>

5.7.3. Constructivism

According to constructivism, individual learners construct much of what they learn and understand it themselves. Knowledge is constructed actively by the learners, as they interact with phenomena from their physical world and have interpersonal exchanges with others (Cohen, 2010; Watts et al., 1997).

Constructivists claim that there is no absolute knowledge; knowledge is relative to each learner's perspective. One of constructivism's "*central ideas is that learners build new knowledge upon the foundation of previous learning*" (Bada & Olusegun, 2015).

In this philosophical approach, the role of the educator is perhaps unclear. As learners learn themselves, what is the role of the educator? Is the educator teacher, instructor, or facilitator? Watts argues that the notion of constructivist teaching is oxymoronic. "To instruct" becomes synonymous with "to teach". Therefore, according to Watts, the terms of construction and instruction together are paradoxical (Watts et al., 1997)

Since the last half of the twentieth century, constructivism has been evolving. It incorporates a range of beliefs, making it a rather multi-faceted methodology or philosophy. By no means '*constructivism is a monolithic philosophy*' (Orlich et al., 2012). Upon reading literature, one can find multiple perspectives from different angles. *Table 92 on page 338* is a small demonstration of various constructivist "branches." This is not a complete or exhaustive list of all constructivist approaches, as this review has not expanded beyond the education context. Some of these approaches can have further "camps"; for example, *social constructivism* has two camps. One camp deals with the role of social structures in individual learning, and the other is concerned with where knowledge comes from (Sharma et al., 2005). Even though constructivism recently started gaining popularity in the learning and teaching (Schunk, 2020), it has roots in the 18th-century philosophies of Immanuel Kant and Giambattista Vico. Some people claim it goes as far back as the 4th-6th century BC, from works by Lao Tzu, Buddha and Heraclitus (M. J. Prince & Felder, 2006).

It is a philosophy that has multiple roots, coming from philosophy, psychology, sociology, and education; it is not confined within the philosophy of education (Bada & Olusegun, 2015). The reviewed literature focuses on education, and constructivism expands beyond schooling. In this respect, there could be more forms of constructivism documented in non-education literature and not included in *Table 92 on page 338*.

As mentioned earlier, lately, constructivism is becoming increasingly popular in the learning and teaching context (Schunk, 2020) and has been producing many new learner-centred teaching approaches (Westwood, 2008). However, constructivism is not some particular pedagogy (Bada & Olusegun, 2015), and it is neither a universal model nor a method. It does not provide any didactic instructions that educators have to commit to or deliver (Scheer et al., 2012). It is a philosophy or theory that explains how people might develop knowledge and learn; therefore, it can be applied directly to the education (Bada & Olusegun, 2015).

With it, new terminologies have arrived in education. For example, “knowledge construction” is learning, a “community of learners” is a class with students, and a “process approach” is rephrased as “learning by doing”. Also, giving hints to students can be considered “scaffolding”. In regards to the curriculum, there are also new terms as well, such as “meaningful”, developmentally appropriate”, and “authentic (Westwood, 2008).

While there are many constructivist perspectives approaching learning from various angles, there is one common feature, a shared principle. That is that knowledge, regardless of the conditions or its origins, is constructed on the learner's mind (Dougiamas, 1998; Royalty, 2018; Scheer et al., 2012). This thesis acknowledges that constructivism is approached from multiple angles. However, It does not adopt any specific branch of constructivism per se. Instead, it utilises the fundamental premise that *the learners construct knowledge in their minds*.

5.8 What is design education?

“Design education cannot simply be technological literacy and teaching people to style things. We have to grow people who can discern rubbish from quality, and then call the rubbish out.” -Dr Welby Ings ¹⁴

On a simplistic view, Design Education (for convenience, abbreviated as DE, only in this section) aims to produce (future) designers while developing design-related skills and improving design-related knowledge. The DE literature suggests it has various aims, and multiple scholars indicate different things. It has been said that DE aims to let students achieve a certain degree of design ability Field (Dorst & Reymen, 2004) and that through DE, students learn to act and think like designers (van Dooren et al., 2020).

Others have suggested that the aim is to provide society with skilled and responsible professionals who can achieve the public's goals (Noël, 2020). Another scholar has hinted that DE is about enhancing national competitiveness due to professional designers' cultivation, making the design industry flourish (Lu et al., 2013). The prolific American design author, Steven Heller, offers another reasoning about design education. He suggests that “*a good (design) education gives you the resourcefulness to solve the problem you have not anticipated*” (Heller, 2005).

DE It is a branch of education that has been proliferating. The skills and abilities being developed are considered relevant and appropriate for the twenty-first

¹⁴ As read in “Field Guide 2020: Growing the Future Designer” (2020, June 10). By Design Assembly. <https://designassembly.org.nz/2020/06/11/field-guide-2020-growing-the-future-designer>

century: creativity, imagination, problem-solving skills and innovative capabilities (Mosely et al., 2020). DE is situated at the boundary of cognitive thinking and creativity. (Jha, 2016). For clarity in this thesis, the operational definition for DE can be defined as *all the pedagogical processes that facilitate the transformation from a novice, amateur designer into a graduate, professionally competent designer.*

5.8.1. Design pedagogy

Pedagogy is a term that usually refers to teaching methods. Etymologically, it is a derivative of the ancient Greek word “παιδαγωγός” (paidagōgos), which is a portmanteau of “ἄγω” (ágō) meaning “I lead” and “παῖς” (pes) meaning “child”. The combined meaning was referring to the didactic actions taken to educate children. Today, pedagogy tends to be used as a general term for both education of children and adults. Other concepts have emerged that expand beyond pedagogy and are considered a further progression, such as andragogy and heutagogy (Blaschke, 2012).

While pedagogy refers to the learner being dependent on the educator for guidance¹⁵, andragogy refers to the teaching methods that are more appropriate to adults. Andragogy is directed towards self-actualisation and gaining experience. Heutagogy, on the other hand, acknowledges that people commit to self-learning by discovery. All these words share the same stem word, and they are using “ἄγω” (ágō), meaning “I lead”. Andragogy is based on “ἄνδρας” (ándras), meaning “man” and heutagogy is based on “εὕρισκειν” (heureskein) meaning “to find” or “to discover”. Scholars and educators have suggested a lot more approaches. For example, synergogy is another approach based on “συνεργία” (synergia), meaning “synergy”, and it implies learning from structured, synergistic interactions.

¹⁵ As this is the case of children who are not yet independent thinkers.

In terms of design education, “pedagogy” might not appear most suitable - agogy for this study. The study investigates adult learning and adopts a constructivist philosophical stance, which means the educator is not at the core of (design) education. Andragogy may appear more appropriate (for this dissertation) considering the focus on adult education, and learners who attend universities and design schools to become designers are adults.

However, none of these terms (other than pedagogy) has sparked a dialogue or has replaced “pedagogy”. That is the case, at least in the design education context. “Design pedagogy” is the predominant term in the literature addressing teaching methods. As such, this literature has been examining design pedagogy.

It is generally accepted that a “method of inquiry and action” is appropriate for teaching the design domain (Gray, 2013; Siegel & Stolterman, 2009). That means the design is being led by asking questions and finding out the cause, or perhaps information about something. Design is a discipline that is not seeking a single correct answer (Williams et al., 2010). Instead, it is seeking appropriate solutions. Hence, design education can be challenging as there is no right or wrong answer.

Another challenge is that as design is a technology-dependent domain, it forces the design curriculum to be updated accordingly (Findeli, 1990). Design education started (in East and West) as an apprenticeship. Students apprenticed to masters until the masters were overtaken by their most talented students, who became the new masters. This education model continues to be present, in which the students are being introduced to design thinking (Buchanan, 2004). While it is commonly agreed that the inquiry method is at the core of the design discipline, design pedagogy's focus has come to change and adapt to digital methodologies (Gray, 2013).

5.8.2. (Design) teaching & learning methods

Science and engineering are traditionally taught deductively (M. J. Prince & Felder, 2006). The instructor relies on providing lectures and explaining theories. Administering tests is part of the teaching process. Tests and exams are expected to evaluate if students have learned or developed particular abilities. No attention is given to explaining why things have to be this way. According to M.J. Prince & Felder, “Why?” is a question that is avoided in the deductive teaching (2006).

Inductive learning and teaching is an alternative approach. It is an umbrella term that involves a variety of instructional methods (that are popular in design schools), such as inquiry-based learning (IBL), problem-based learning (PBL), and project-based learning. Other instructional methods that use an inductive approach are discovery learning, case-based learning, and just-in-time teaching. These methods are learner-centred, and they mainly involve discussions, exploring questions, problem-solving sessions in class (active learning). Much of the classwork occurs in student groups (cooperative or collaborative learning) (M. J. Prince & Felder, 2006).

While numerous (inductive) teaching and learning methods are being deployed in design education, this literature review focuses on the PBL method. It is a method at the very essence of teaching design (Williams et al., 2010). It is applicable in many stages, from the early moments when students are still in the novice stage until their final graduating project. It is used to educate problem-solving. It does so without instructing specifically how this task has to be taught (Maya & Gómez, 2015), making teaching design perhaps somewhat arbitrary.

As a teaching strategy, PBL encourages students to keep exploring and solve problems based on their competence and knowledge of the domain (Williams et al., 2010). PBL has also been referred to by other names, such as project-

based learning, anchored instruction, and authentic learning (Arends, 2012, p. 396). One of the significant features of PBL is that students are instantly immersed in a real-world context. For example, a maths teacher will place the students in a situation where maths is used, like estimating the supermarket checkout's shortest line using calculated mathematics. PBL involves being immersed instantly in questions, situations, problems, and challenges, going beyond the isolated school knowledge (Wiggins, 2006). The complexity of problems from the real world encourages teamwork, helps become cooperative among learners, and provides instructional tasks suitably challenging for the targeted students' (Stepien & Gallagher, 1993).

The roots of PBL can perhaps be traced to John Dewey, who emphasised the interaction of the human/student with the environment (Zhang et al., 2017). Besides the direct connection with the real world, other features that PBL encompasses can be found throughout literature and have been summarised by (Arends, 2012):

- *Situation or problem-focused.* Instead of focusing on specific academic principles or skills, PBL is organised around real-life situations and problems that can be both personally and socially relevant and meaningful (to students).
- *Interdisciplinary focus.* Despite PBL being centred on a specific subject, it draws upon other disciplines and areas as well. Teaching design, engineering, anthropology, or policy studies may significantly contribute to the learning experience.
- *Authentic investigation.* Students must analyse information, conduct experiments, create hypotheses, attempt to make predictions, draw conclusions, and overall pursue *authentic* investigations.
- *Production of exhibits and artefacts.* In design education, PBL classes' outcome is deliverables that resemble the professional design practice. These can be tangible products or intangible designed solutions, such as non-materialised design concepts.

- *Collaboration.* PBL is characterised by collaborative work, in which students must cooperate in workgroups. Collaboration creates opportunities for dialogue and shared inquiry and further developing interpersonal and social skills.

It is important to emphasise that PBL is not suitable for conveying enormous content to students. Direct instruction, lectures and presentations are more appropriate for sharing and transferring large quantities of information to students (Arends, 2012). Instead, PBL is more suitable for developing problem-solving skills and getting the students to work collaboratively. At the same time, develop social skills (Arends, 2012). PBL has three intended learner outcomes (Arends, 2012)

A) *Developing thinking and problem-solving skills.* Students get to use and deploy their intellectual and cognitive abilities. They get to practice analysing, criticising, drawing conclusions and making judgments.

B) *Social skills and adult role behaviour.* PBL also helps students learn and familiarise themselves with real-life situations, work with others, deal with real objects and situations, and force them to spend more effort thinking (rather than reciting).

C) *Independent learning.* PBL is a method that aims to help students become independent learners and reach higher levels of autonomy as they grow. Open inquiry and freedom of thought are embraced in PBL, assisting students to become confident in their intellectual skills and abilities.

Another teaching method, inquiry-based learning (IBL) shares intellectual roots with PBL, and they, as such, do have a clear connection (Arends, 2012; M. J. Prince & Felder, 2006). IBL was developed to teach students how to think (Arends, 2012). It is about creating a teaching environment where students are

presented with a problem or an observation that students have to explain (M. J. Prince & Felder, 2006). The objective is to let students “inquire” (hence inquiry-learning) and learn by doing so. Arguably, the same can be said about problem-based learning or discovery research.

(Arends, 2012) explains specific learning outcomes of inquiry-based learning, which can help teachers examine what areas they need to focus on and plan their classes accordingly. The learning outcomes are:

- Students can gain knowledge about inquiry focus.
- Students can develop thinking and reasoning skills.
- Students can develop metacognitive skills.
- Students can develop optimistic attitudes towards inquiry and appreciate investigating the social and physical world.

As mentioned earlier, both inquiry and problem-based methods share a connection (M. J. Prince & Felder, 2006). As their name suggests, *inquiry-based learning* is focused on *inquiring* or questioning. The instruction's primary mechanism becomes questioning, and the pedagogy and teaching activities revolve around raising questions. *Problem-based learning* focuses on a problem, so the teaching activities and pedagogy revolve around the issue.

PBL and IBL are just two instructional methods out of many. Other methods might be multiple “-based” methods, such as case-based teaching, technology-based learning, team-based learning, scenario-based learning, resource-based learning, and others such as discovery learning, student-centred learning, just-in-time teaching, practice learning, learning-by-doing, and experiential learning.

5.8.3. Signature Pedagogy

Signature Pedagogies is a term by Lee S. Shulman, who referred to the different learning ways that higher education students experience that refers to the professions that each course is preparing students for (Shulman, 2005). For example, learning to become a translator is distinctively different from learning to become a designer. Such “professional” differences, which indicate different pedagogies, can be labelled as Signature Pedagogies. Shreeve has identified five signature pedagogies that are common in design education (Shreeve, 2016)

The Studio

Studio practice characterises the design domain and design education. Studio practice entails critique¹⁶ from instructors and superiors, as well as peers. The direct instruction is kept to a minimum, and the learning environment is informal and shaped by exploration. It is an environment where individuals learn to think and act according to the situation's appropriateness (Gray, 2013). It is a semi-permanent location where students are learning through peer engagement (Shreeve, 2016). In some cases, the online learning environment can be more appropriately suited as it resembles a situated environment that replicates the conditions in which professional designers are working.

¹⁶ Critique is another signature pedagogy, discussed separately.

Projects and the brief

Designers always find and formulate problems within the relatively broad context of the project brief. They are not limited to fixated 'given' problems (Cross, 2001). A project brief comes with specific requirements; the so-called constraints can be a catalyst to creative thinking. Students view the project brief critically and keep questioning it as they explore and comprehend the problem. This way of interacting with the project brief becomes a dialogue¹⁷ with the client (or instructor in the context of design school. Onwards, this dialogue becomes a contract (Tovey, 2015a).

Materiality

In design learning manifests in something, a designed artefact, a product, a portfolio. That means there is some materiality in design, and that is a fundamental aspect of learning design. '*Doing and making*' is at the core of being a design student, and materiality can be considered a part of the signature pedagogy of '*doing and making*'. Even when students are working on digital products, for example, a typeface, there is still a material nature to such digitally tangible products, and such design would not be limited to a screen. Other things like, for example, understanding how the typeface responds to ink and paper, printing processes or scale. Such things do entail materiality, which contributes to learning and growing as a designer (Shreeve, 2016)

¹⁷ Critique is another signature pedagogy, discussed separately.

Dialogue

As mentioned earlier, interacting with the project brief, questioning it, and problematising around it becomes a dialogue with the instructor or the client (Tovey, 2015a). Design is a social process, and designers will have to become skilled negotiators (Dorst, 2007a). There is a dialogic nature of learning in the design school, which appears to be a conversation between students and instructors. This conversation has also been described as an 'exchange' (Shreeve, 2016). Tutors prompt and question students, encourage them to make decisions, consider alternatives, and imagine possibilities until they finally decide on a course of action on their assignments and projects.

The Critique

The design critique (also known as crit) is a meeting with at least one instructor and possible other peers, and it involves a critical reflection (Makhoul & Morley, 2014). Learners establish proper ways to respond to a project brief. A dominant characteristic of design education the critique can be found in formative, summative assessment, and feedback sessions and it is offered by peers and instructors and peers (Gray, 2019). It also helps establish ways of thinking and evaluating that are appropriate in design. In contrast with the other signature pedagogies mentioned earlier, the critique is less frequent in the industry than in a design school. Nonetheless, there are critical discussions in the industry (Shreeve, 2016).

5.8.4. When do adult learners learn best?

Adult learners have unique challenges, expectations, and motivations (Hodgson & Kambouri, 1999; Yerrabati, 2017). In contrast to younger learners, adults acknowledge responsibility for their learning, improving their management skills. Career and job prospects are substantial motivators for adult learners (Malcolm S Knowles et al., 2014, p. 146; Yerrabati, 2017).

Adults have the motivation to gain knowledge that helps solve real-life problems they may encounter later. It has been said that adults learn best when their skills and knowledge are presented in a real-life situation context (Ozuah, 2005). Ann Hodgson and Maria Kambouri (1999) suggest three underlying factors that characterise how adults learn.

- a) their(individual) characteristics
- b) their justified reasons for participating, and
- C) the context in which they are students and learning.

According to the authors, these three factors are a significant difference between adult learning and children's compulsory education. Other factors that affect adult learning can be past education or experience or (as mentioned earlier) the location where they are (Hodgson & Kambouri, 1999). Philip Ozuah (2005) has compiled a list with several assumptions about adult learning's characteristics and nature. The list is shown in *Table 6 below*.

Table 6. Ozuah (2005) Adults learn best when...

<i>...there is a need or desire to learn something.</i>
<i>...there is a safe, non-threatening environment.</i>
<i>...their unique, individual learning style needs are addressed accordingly.</i>
<i>...their experience and skills are used and valued.</i>
<i>...they are given opportunities to take control of their learning process.</i>
<i>...there is intellectual and psychomotor involvement in the learning process.</i>
<i>...they have sufficient time to familiarise and assimilate new information.</i>
<i>...they are given opportunities to put into practice and apply what they have been learned.</i>
<i>...relevant problems and functionally practical applications of concepts are focused on.</i>
<i>...they receive valuable feedback about their progress as they are approaching their goals.</i>

5.9 Creativity and idea generation

“Creative people surprise us constantly by challenging assumptions, flipping ideas, and expanding, contracting, and recombining things in their heads. It is a three-ring circus in there.” (Nielsen, 2016, p. 29)

What is creativity? Many philosophers and psychologists have spent a significant amount of time studying and exploring what creativity is (Dow, 2017). With time, as societies have been evolving and transitioning from various ages and eras in history, creativity has always been present in one way or another. Ideas can be considered as the products (or by-products) of creativity. All the artefacts that archaeologists unearth through their expeditions can be regarded as signs that these items were once someone’s idea materialised. Their ideas got preserved for hundreds or thousands of years in the form of an artefact.

Creativity and idea generation have been intertwined since the beginning of humanity. Historically, there have been several periods of a peak in idea generation and creativity. Certain societies have creatively flourished in these historical periods, such as Ancient Greece, Renaissance Italy, and late-twentieth-century America (Moran, 2010). The conditions in which there is a creativity-enhancing climate have been described as “golden”, deriving from ‘golden ages’ (Walker, 1986) and ‘*creativogenic*’ (Arieti, 1976). It has been argued that creativity needs a society that simultaneously values novelty and appropriateness (Moran, 2010). From that point of view, all the example societies mentioned above would qualify.

Ancient Greece had a society where creativity was valued and regarded as divine. It is considered the first time creativity was an integral part of society in history, with citizens being creative producers. However, it was not believed that someone could become more creative or generate ideas through practice.

It was thought that creative ideas were gifts from the gods, coming ‘*out of his or her mind*’. There was an outside source providing the ideas. People with ideas were considered *messengers* (or *conduits*). Creative ideas were delivered from the gods to the public through these messengers (R. W. Weisberg, 2006, p. 90). The muses, goddesses, and spirits in Greek mythology were the intermediaries of the gods. The muses inspired the creative arts (Puccio & Cabra, 2012, p. 189). As such, idea generation was not considered ‘human’, as ideas came indirectly through the gods’ intermediaries.

Scholarly discussion on the ability to generate ideas (not just the discussion about ‘ideas’ in the strict sense) came in much later. The modern study of creativity began in the 19th century, despite many referring to the 1950s as the beginning (Becker, 1995). However, there has been little talk about idea generation. Google Ngram Viewer, a search engine tool that provides charts with frequencies on queries found in printed sources¹⁸, indicates that idea generation discussion may have started in the 1960s, as *Figure 5 on page 59* shows. Creativity started a few decades earlier (*Figure 6 on page 59*). Comparatively, the discussion of idea generation is minuscule next to creativity. A series of exploratory searches were performed and captured on June 20th, 2020. These are displayed on the following pages.

The term ‘IDEATION’ (*Figure 7 on page 59*) has been mentioned for much longer. It must be acknowledged that it is also a medical/psychological term (for example, suicidal ideation), and the given graph does not specify the volume that explicitly deals with creativity. ‘Creative thinking’ has also been mentioned since the 20th century. Still, percentage-wise, it has performed weaker than the previously mentioned terms (*Figure 8 on page 60*).

¹⁸ Web link: <https://books.google.com/ngrams>

Terms that deal with the betterment of creativity, such as encouraging, fostering, or improving creativity (*Figure 9 on page 60*), were also looked up. While they have also been getting attention since the mid-20th century, they have relatively weak performance percentages. *Figure 10 on page 60* is provided as a comparative reference to the scale to help readers understand the volume of the terms altogether. It is also notable that 'creativity' dwarfs all other examined terms, as *Figure 10 on page 60* indicates. Ideation, idea generation and creative thinking have a considerable distance in mention, possibly because creativity is also a generic term and not as specific as the others.

Moreover, in the 1950s, the distance between these terms was not as significant. It is worth noting that the percentage axis shows the percentage concerning a single, unified corpus of books. Google provides various corpora such as American and British English and other languages.

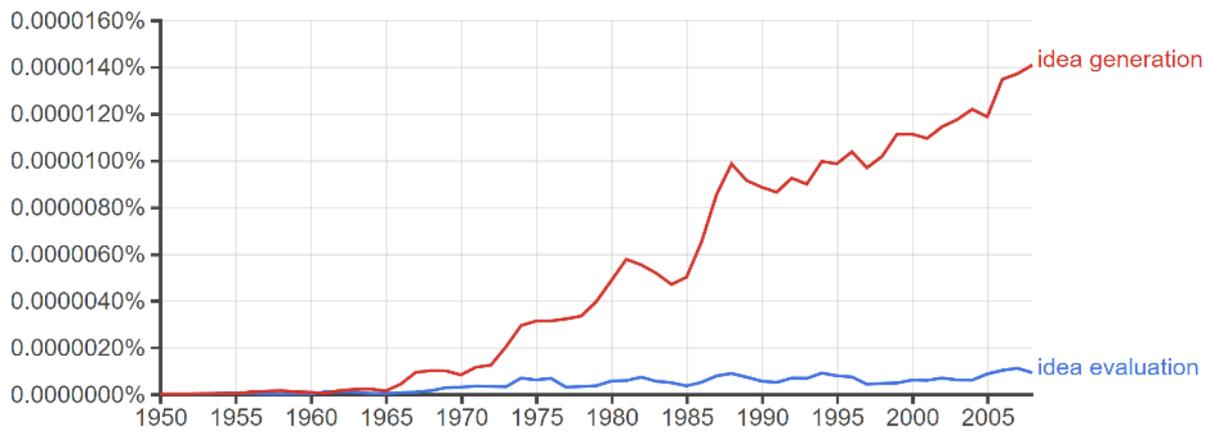


Figure 5. 'idea generation' and 'idea evaluation', 1940-2008, 'English (2012)' corpus.

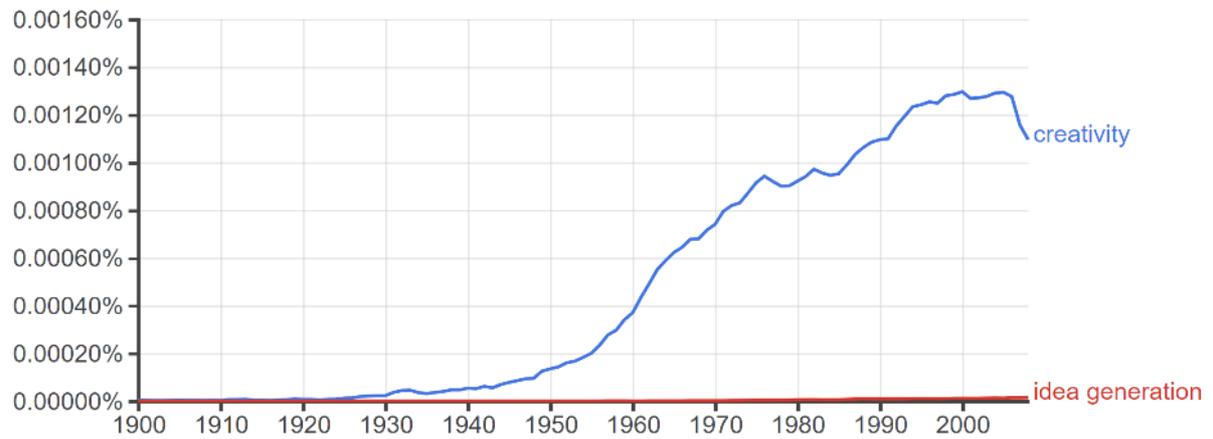


Figure 6. 'creativity', 1900-2008, 'English (2012)' corpus.



Figure 7. 'ideation', 1700-2008, 'English (2012)' corpus.



Figure 8. 'creative thinking', 1900-2008, 'English (2012)' corpus.

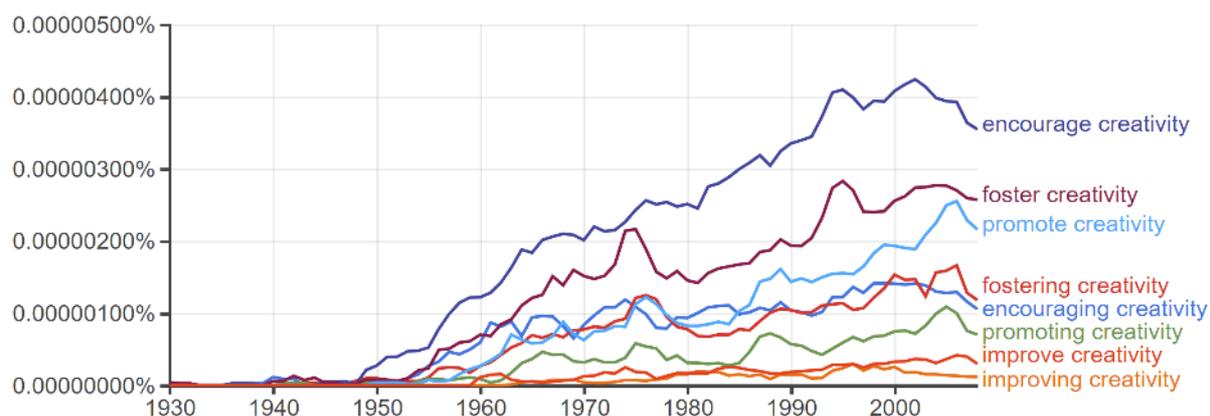


Figure 9. various verbs with creativity, 1930-2008, 'English (2012)' corpus.

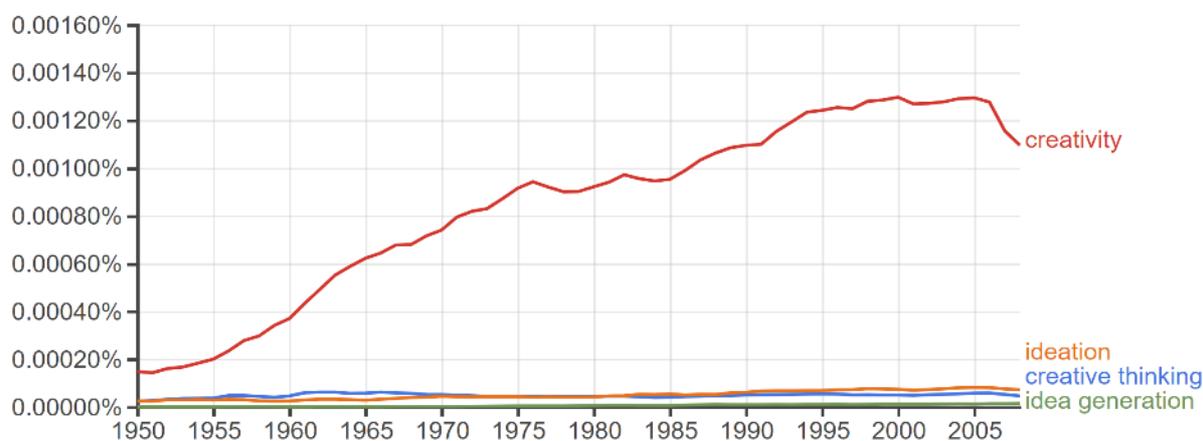


Figure 10. 'creativity', 'ideation', 'creative thinking' and 'idea generation', 1950-2008, 'English (2012)' corpus.

These results do not necessarily reflect the complete picture. Older books might not be digitised or become available in a digitally native format. It is also possible that the OCR software¹⁹ used by Google may have indexed mistakes. Google is vigilant about such mistakes; they have to be discovered and reported first. Also, older books may not be as prevalent as recent publications. These problems and more make Google Ngrams not considered very authoritative for extensive research (Wired Magazine has explained the pitfalls of Using Google Ngram²⁰).

While these graphs may not be purely academic and should not be accounted as authoritative, their value lies in proving that there has been more and more written on creativity and idea generation since the beginning of the 19th century. It could be argued that there has been a growing body of literature about virtually any topic since then. Hence, growth was seen in the charts above. While it may be true that many topics have been growing in absolute terms, the graphs shown here do not depict absolute count. They are displaying percentages concerning what was published each year, and all graphs displayed above show growth, despite also portraying some downturns.

As such, while it is true that literature has been growing nevertheless, idea generation and creativity have also been growing in mentions, gaining popularity. Naturally, as the field has evolved, there have been several descriptions of creativity. Some authors suggest there are hundreds of different definitions (Lucas, 2005). *Table 93 on page 340* by Dow (2017, p. 17) shows various creativity narratives that have emerged over the years. As mentioned earlier, even though many scholars are interested in creativity, there is no universally agreed definition of creativity (Runco & Jaeger, 2012).

¹⁹ Optical Character Recognition software, that converts scanned images to searchable and indexable text.

²⁰ Zhang, S. (2015, October 12). The Pitfalls of Using Google Ngram to Study Language. Wired.

<https://www.wired.com/2015/10/pitfalls-of-studying-language-with-google-ngram>. Accessed on June 20th, 2020.

There are two remarks can be made regarding the state of creativity (Treffinger et al., 2002):

- 1) While there are many definitions of creativity, none is universally accepted, and,
- 2) Even though many scholars use the same term '*creativity*', they could be referring to different concepts and constructs.

Beghetto and Kaufman (Beghetto & Kaufman, 2017, p. 37) have examined some key theoretical questions in creativity research. These are (in no particular order):

- a) Who is creative?
- b) How are we creative?
- c) Why are we creative?
- d) What is creative?

Addressing these questions is vital for advancing the field. In their research, Beghetto and Kaufman have also examined some creativity models. They have also been looking at the questions above and which question each model addresses. *Table 93 on page 340* provides an overview of this work. One more detail to add is that a creative idea's qualities are temporal, especially regarding originality (Puccio & Cabra, 2012, p. 192). A creative idea stops being as creative as novelty diminishes.

Table 7. Key theoretical question summary (Beghetto & Kaufman, 2017, p. 37)

<i>Research Question</i>	<i>How creativity theories tackle the question</i>	<i>Example Theories</i>	<i>Example Theorists</i>
<i>Who is creative?</i>	<i>Aims to explain what makes a person creative and looks at how creativity evolved</i>	<i>Componential Model</i>	<i>T. Amabile</i>
		<i>Investment Theory</i>	<i>R. J. Sternberg, T. Lubart</i>
		<i>4-C Model</i>	<i>J. C. Kaufman, R. A. Beghetto</i>
<i>How are we creative?</i>	<i>Illustrates the approaches or ways that people use in their pursuit of creativity</i>	<i>Creative Process Models</i>	<i>G. Wallas</i>
		<i>Geneplore</i>	<i>T. B. Ward, S. M. Smith, R. A. Finke</i>
		<i>Blind Variation and Selective Retention</i>	<i>D. K. Simonton, D. T. Campell</i>
		<i>Janusian Thinking</i>	<i>A. Rothenberg</i>
<i>Why are we creative?</i>	<i>Attempts to reason why people use creative thinking and act upon their ideas</i>	<i>Intrinsic/Extrinsic</i>	<i>E. Deci, R. Ryan, T. Amabile</i>
		<i>4-G Growth. Gain. Guidance. And Giving</i>	<i>M. Forgeard, A. C. Meckenburg</i>
		<i>Matrix Model</i>	<i>K. L. Unsworth</i>
		<i>Creative Learning</i>	<i>R. A. Beghetto</i>
<i>What is creative?</i>	<i>Attempts to describe creativity and capture its differences among domains</i>	<i>Propulsion Theory of Creative Contributions</i>	<i>R. J. Sternberg, J. C. Kaufman, J. E. Pretz</i>
		<i>Systems Model</i>	<i>M. Csikszentmihalyi</i>
		<i>Amusement Park Theoretical Model</i>	<i>J. Baer, J. C. Kaufman</i>

While the questions can cover much content, none is explicitly related to idea generation. This thesis's scope explores how the design school impacts the students' ability to generate ideas. The only question (from the list above) that can be somewhat indirectly relevant is 'how are we creative?'. Addressing this question is also (indirectly) addressing the components that improve generating ideas.

The literature has a plethora of creativity theories and many ways to describe how someone is creative. Some creativity theories may be more suitable, while others might deem more irrelevant. Some of the theories by prominent creativity scholars are briefly explained on page 340.

5.9.1. Assessing creativity

A report published in 2002 titled 'Assessing Creativity: A Guide for Educators'²¹ contains various characteristics and indicators that affect creativity. Multiple sections of the report have an emphasis on idea generation. The report's principal author is Donald J. Treffinger, PhD, a prolific creativity scholar specialising in creativity and creative problem-solving. According to the report, educators can consider various creativity assessments (listed in the report) and link their instructional planning with creativity assessments. The report is provided as a tool to educators, helping them identify and locate students' characteristics that impact creativity. Even though the report is targeted at educators who work with young students, the foundational research that the report is based on came from studies that involved adults (Treffinger et al., 2002, p. viii)

The report claims that many characteristics can be nurtured and taught over time. The authors clustered these characteristics into four categories. Three categories have the word 'idea' in their title. The categories are *Generate Ideas*, *Openness and Courage to Explore Ideas*, *Digging Deeper into Ideas* and *Listening to One's Inner Voice*. Interested readers can view [Figure 22 on page 321](#).

Generating Ideas

This category includes characteristics commonly described as creative thinking abilities or **divergent thinking**. There are five characteristics (shown in [Table 10 on page 85](#)). a) Elaborative, b) Flexible, c) Fluent, d) Metaphoric thinker and e) Original.

Digging Deeper into Ideas

²¹ Legal: The work reported herein was supported under the Educational Research and Development Centers Program, PR/Award Number R206R000001, as administered by the Office of Educational Research and Improvement, U.S. Department of Education. The findings and opinions expressed in this report do not reflect the position or policies of the National Institute on the Education of At-Risk Students, the Office of Educational Research and Improvement, or the U.S. Department of Education.

This category refers to cognitive characteristics that are related to **convergent thinking** and critical thinking. There are seven characteristics in this category (also shown in *Table 16 on page 91*). These are a) Analysing, b) Intolerant of ambiguity or bringing order to disorder, c) Evaluating, d) Preferring complexity or understanding complexity, e) Reorganizing or redefining, f) Able to see relationships, and g) Able to synthesise

Openness and Courage to Explore Ideas

This category includes characteristics that refer to **personality** (assumingly, personality in this context means identity). It has been the most 'populous' category accounting for 16 characteristics (also shown in *Table 23 on page 99*). The factors are a) Openness to Explore Ideas, b) Adaptability, c) Aesthetic sensitivity and/or interests, d) Capacity for fantasy or imagination, e) Highly curious, f) Integrative of dichotomies, g) Intuitive, h) Open to emotions, i) Open to experience and ideas and ideas, j) Playful, k) Sensitive to problems, l) Risk-taking (or thrill-seeking), m) Humorous, n) Uninhibited in expressing an opinion, o) Tolerance of ambiguity, p) Unwillingness to accept authoritarian assertions without critical examination, and q) Willing to grow

Listening to One's Inner Voice

A category that includes an understanding of the self and who you are. In other words, being **mature** and having general wisdom towards adulthood. This category has nine characteristics (also shown in *Table 40 on page 116*) These are a) Sees himself/herself as creative; Self-confident, b) Energetic, c) Independent of thought, d) Intense concentration and absorption in work, e) Reclusive, f) self-discipline, Self-initiated, g) Persistent or perseverant, h) Rejects stereotyping, and i) Hard working.

It is unclear what purpose this categorisation serves and how the characteristics were allocated, or why they belong to only one category. These categories are not relevant in the conceptual framework of this thesis, but the characteristics (traits) are. In total, 37 characteristics are listed and each personality trait is explained further in section [6.3 on page 85](#) (divergent thinking), in section [6.4 on page 91](#) (convergent thinking), in section [6.5 on page 98](#) (personality characteristics) in section [6.6 on page 116](#) (Inner-voice).

<i>Treffinger's Categories</i>	<i>Relevant section</i>	<i>Section</i>	<i>Page</i>
<i>Generating ideas</i>	<i>Divergent thinking</i>	6.3	85
<i>Digging Deeper into Ideas</i>	<i>Convergent thinking</i>	6.4	91
<i>Openness and Courage to Explore Ideas</i>	<i>Personality characteristics</i>	6.5	98
<i>Listening to One's Inner Voice</i>	<i>Inner voice - Maturity</i>	6.6	116

It is worth noting that the report 'Assessing Creativity: Guide for Educators' also provides some main takeaways for instructors to remember:

- These characteristics vary from person to person and from discipline to discipline.
- No person or student possesses or demonstrates all these characteristics at the same time.
- The characteristics are also varied and include past experiences, personality traits, as well as cognitive abilities.
- The underlying research used to compile these factors is mostly from research that involved adults.
- Some of the characteristics can appear to be opposites and conflict with each other.
- Possibly these characteristics can be manifested negatively.

5.9.2. Factors affecting creativity.

One of the main recurring questions in creativity literature has been, what are the characteristics of a creative person? One way to respond to this question is by listing certain items/factors impacting creativity or describing attributes of creative people. The argument is that certain personality traits can lower or enhance creative thought and creative behaviour (Feist, 2010, 2019).

Studying factors (or influences) is one approach that academics have used to disseminate complex problems, such as creativity or intelligence. John Carroll is the author of an outstanding book titled '*Human Cognitive Abilities: A Survey of Factor-analytic Studies*' (1993). This book examines, and re-analysing previously published factors—the areas covered in the book range widely. For example, idea production areas ([Table 81 on page 323](#)), reasoning, memory and learning, psychomotor abilities, and other areas. There are also higher-order factors of cognitive ability too ([Table 80 on page 322](#)).

The above book is a colossal meta-analysis of multiple studies with numerous factors and priceless encyclopaedic value. With its 824 pages, it is in the other regions informally considered as (two or three) books bundled in one volume. As idea generation is a cerebral activity, to illustrate the variety of cognitive ability factors mentioned throughout the literature, [Table 80 on page 322](#) is provided as a reference. Interested readers can refer to Jhon Carroll's book for more information.

[Table 81 on page 323](#) shows the abilities of the idea production. Idea production is perhaps the same as idea generation, with the difference that production refers to the output, making, producing, or 'manufacturing' from components. In contrast, Idea generation refers to production holistically, not just the output. The idea production abilities are explained with descriptions based on Jhon Carroll's definitions (1993, p. 438).

When it comes to factors affecting creativity, Ellis Paul Torrance, a dominant creativity scholar, approximately 60 years ago surveyed a large volume of available studies. Torrance compiled a list with 84 factors (*Table 82 on page 324*) that differentiate creative people from less creative people (E. Paul Torrance, 1962, p. 66). Another notable list published a few decades later is by Gary Davis. He has gathered about 200 positive personality traits (*Table 83 on page 325*) and has grouped them into 16 traits (2004, p. 85).

Another list worth mentioning is the research conducted by Jhon Hattie, a New Zealand professor in education. Hattie has been comparing education studies worldwide and compiled an extensive list of factors influencing student achievement. The original list from 2009 had 138 factors²². Since then, the list has received two updates, with the latest research-based on nearly 1200 meta-analyses containing 252 factors²². John Hattie's list does not focus on creativity. However, the sheer volume of factors (252!) indicates that education is a very complex and multifaceted phenomenon.

²² 'Hattie Effect Size List - 256 Influences Related To Achievement'. *VISIBLE LEARNING*, <https://visible-learning.org/hattie-ranking-influences-effect-sizes-learning-achievement>. Accessed 19 May 2020.

5.9.3. Divergent thinking

Any learning activities, exercises, or educational material explicitly about fostering novelty and originality also improves generating ideas. Idea generation activities are usually divergent, and they do promote exploration. On the contrary, activities related to implementing, realising and making ideas happen are convergent (Werner & Tang, 2017, p. 357). Divergent thinking is quite helpful in creativity studies. Many people associate divergent thinking with creativity. Creativity requires many things, including but not limited to the divergent thinking (Runco, 2018). Generally speaking, there are three ideological camps with diverse opinions about the divergent thinking (Runco & Chand, 1995).

- a) one camp tends to associate divergent thinking with creativity, and they consider it to be synonymous,
- b) in another camp, some scholars believe that design thinking is unrelated to creative thinking, and
- c) the third camp is by scholars positioned in the middle, and they consider that divergent thinking signifies an *estimate* of the *potential* of creative thinking.

Research on divergent thinking has been approached from multiple angles and focuses differently. Runco and Acar have been investigating divergent thinking literature. They provide a table with divergent thinking 'hyperspaces', shown in *Table 94 (on page 345)*. Hyperspace is a term borrowed from statistics and physics, in which it is possible to explore one dimension and then explore a perpendicular dimension (2019, p. 231). These hyperspaces show 13 dichotomies as dimensions and their perpendicular dimensions (2019, p. 232).

5.9.4. Convergent thinking

Convergent thinking, sometimes also called critical thinking (Treffinger et al., 2002, p. 13), involves the cognitive characteristics that have to do with the ability to give a “correct” or suitable answer (A. Cropley, 2006). Although this dissertation focuses on improving the ability to generate ideas, it could seem that convergent thinking is irrelevant, as it may seem it has to do with evaluating ideas. Moreover, convergent thinking refers to more than just evaluating ideas. It emphasises speed and accuracy, logic, and reapplying pre-set techniques; it focuses on recognising the known and familiar and deals with accumulating information (A. Cropley, 2006). All these factors make convergent thinking have a broader scope of evaluating ideas. It also refers to having the ability to assess ideas rather than the assessment itself. That means convergent thinking entails deepening ideas, analysing them, and making them more focused (Treffinger et al., 2002, p. 13).

Cropley suggests that convergent thinking deals with the known and familiar. The answer or response produced relies on the existing knowledge (1997, 2006). Therefore, convergent thinking is most effective when a convenient, premade solution is available. The answer needs to be recalled from accumulated knowledge in such a case. It has to be selected by applying a conventional and logical search that can help determine the ‘correct’ answer (2006). That does not mean convergent thinking is only applicable to well-defined problems. Guilford, as discussed by Proctor (2014b, p. 45), has argued that convergent and divergent thinking are not isolated and are intermixed, which can, for instance, lead to the case where a divergent approach can be used toward a convergent solution.

5.9.5. Divergent and convergent thinking

Both concepts originate from Guilford's intelligence model known as *SOI* or '*Structure of Intellect*' (1968, p. 10) (model is shown [on page 311](#)). Both types of thinking (convergent and divergent) are considered to be implicated in creative thinking (Goldschmidt, 2014, p. 46) and contribute to gaining creative insights (Proctor, 2014b, p. 43). While divergent thinking refers to the ability to generate many ideas, convergent thinking can focus on discovering which idea is good or could be improved further (Hokanson & Kenny, 2020; Mahmoud et al., 2020, p. 191; Val et al., 2017). Some of the differences between the two thinking modes are shown in ([Table 8 on page 72](#))

As learners move seamlessly between convergent and divergent thinking, they build the knowledge necessary for delivering possible design solutions. These fast and constant transitions between the knowledge domain (what learners know already) and the concept domain (what learners need to know) lead learners to make informed design decisions. These decisions foster higher-order thinking skills and make both modes of thinking into habitual characteristics of problem solvers (Stables, 2020, p. 11)

It has been argued that making this dichotomy (of divergent and convergent thinking) clear and explicit is not particularly helpful in designing (Lawson & Dorst, 2009, p. 196). It clarifies what phase designers are on an open mind mode where all ideas are welcomed (divergent) or filtering mode. Ideas are being reduced as the preferred ideas go ahead (convergent). In the process, the surviving ideas are being refined further.

Table 8. Example of Convergent and Divergent Thinking

<i>Kind of thinking</i>	Convergent	Divergent
<i>Typical Processes</i>	<ul style="list-style-type: none"> • Attaining accuracy and correctness • Being logical • Combining what “belongs” together • Drawing towards the single best answer • Making associations only from adjacent fields • Playing it safe • Preserving the already known • Reapplying set techniques • Recognizing the familiar • Sticking to a close range of clearly relevant information 	<ul style="list-style-type: none"> • Being unconventional • Blending the disparate • Generating multiple answers • Noticing new possibilities • Retrieving a broad range of existing knowledge • Seeing the known from a different angle • Shifting perspective • Taking risks • Transforming what is known
<i>A typical result for the Individual</i>	<ul style="list-style-type: none"> • A fast, “correct” answer • A sense of safety and security • Better understanding of the facts • Closing or terminating an issue • Greater familiarity with the existing • Growth of a high level of skill 	<ul style="list-style-type: none"> • Associating ideas from faraway fields • Deviating from the usual • Feeling excitement or uncertainty • Novel ways of doing things • Producing surprising answers • Risky or exciting possibilities • Unconventional or various solutions

The proposed model of ‘multiple divergence convergence’ suggests that as ideas are being generated (convergent), there is a tendency to add details to the ideas (convergent), which results in an overall decrease in the number of solutions (Liu et al., 2003, p. 347). It is known that designers move fast and oscillate between divergent and convergent thinking modes (Stables, 2020, p. 11). Even though each phase has its unique characteristics and aspects, they can overlap (Bowers, 2011, p. xv).

Another aspect that needs to be mentioned is that most education emphasises convergent thinking, seeking the correct answers (Glăveanu, 2018; Hargrove & Rice, 2015, p. 161; Hokanson & Kenny, 2020). As such, learners are not challenged to think beyond and adopt a dualistic viewpoint (Hargrove & Rice, 2015, p. 161). On the other hand, design education is about creating opportunities for divergent thinking. Simultaneously, the convergent skills are sharpened over time (Hokanson & Kenny, 2020).

5.10 Creativity and personality traits

Personality refers to characteristics or personal level dimensions that make individuals unique and form their distinct character (Matthews, Deary, & Whiteman, 2009). Traits are those distinctive qualities that make these characteristics. There have been suggestions of a creativity personality: being consistently creative over time, however, there are various notions on what it means to be creative, and there has been debate whether traits among creative individuals are demonstrated in different settings (Helson, 2011). It is also reported that personality traits change over one's lifespan (Bleidorn et al., 2021), making the study of personality traits challenging.

Moreover, traits are important predictors that can help describe behavioural patterns in the long term (Caspi, Roberts, & Shiner, 2005). As design education develops various abilities over time, including idea generation, identify which traits impact the ability to generate ideas and how these are developed. It has also been suggested that it is possible that combining certain personality traits with certain social conditions can foster or harm specific outcomes (Roberts, Kuncel, Shiner, Caspi, & Goldberg, 2007).

There are several models of personality traits. Perhaps the most popular model might be 'The Big Five' or the 'Five-Factor Model' (Goldberg, 1990), which sometimes is being referred to as OCEAN. It is an acronym that stands for five personality traits that are considered significant: Openness; Conscientiousness; Extraversion; Agreeableness, and Neuroticism. However, personality trait models are not specific to creativity, but rather generic psychology studies. There have been creativity studies that are explicitly looking at personality traits. A beneficial publication was published earlier by Treffinger et al. (2002). This publication includes multiple personality traits and contributes a vocabulary with traits at the conceptual framework for this PhD (see section [6 on page 78](#)).

5.11 Why 'disregard' the evaluation or quality of ideas?

The quality of an idea is perhaps the most critical factor after many ideas are generated when it is time to choose the good ideas. Judging and evaluating ideas can be part of the idea generation process, depending on the person or circumstances. It has been argued that most organisations would prefer generating one exceedingly good idea and 99 terrible ideas instead of 100 mediocre ideas (Girotra et al., 2010). It would be foolish to disregard the evaluation of ideas as unnecessary or relevant.

As explained earlier in chapter 5.7, it is widely accepted that creativity is the ability to produce novel, original and unique work, which is also helpful or appropriate (Moran, 2010; Runco, 2003; Sternberg & Lubart, 1996). Such a definition requires both idea generation and idea evaluation. Both are considered two constituents, essential creative thinking processes (Runco, 2003; Sowden et al., 2015).

The evaluation of ideas is only excluded in this study as the focus is to explore how to improve the ability to generate ideas in design education. As the evaluation of ideas happens after ideas came into being, it is a later stage in ideation after idea generation process timeline, therefore out of scope in this PhD.

5.12 How do educators improve students' ability to generate ideas?

Idea generation has been described as an exploratory path where the possibility of a failed and collapsing thought is recognized. Ultimately failures are considered a contributing factor to success (Bramston, 2016). In the idea generation phase, judgment or destructive arguments should stay away and be refrained. Alex F. Osborn, the author of the hugely influential 1954 book 'Applied Imagination' in 1954, established the rules for brainstorming, the well-known idea generation technique. He also suggested two principles for increasing the production of ideas.

The principles are a) defer judgment of ideas and evaluate them later, and b) quantity breeds quality (Osborn, 2001, p. 124; Ziegler & Diehl, 2008). These are two crucial guiding principles, not only to be memorised but also to be practised every time anyone is engaged in idea generation. One way to improve idea generation could be to always adhere to these two principles. Another way could be to teach a plethora of idea generation tools and techniques. However, these approaches would be a too simplistic way to explain how to improve idea generation.

Idea generation is fundamentally ingrained in creativity, and these two concepts are inseparable. Creativity cannot exist without idea generation. Fostering creativity means improving idea generation skills and idea selection skills. There have been some suggestions for promoting creativity in the classroom. Alane J. Starko suggests three keys to creativity in the classroom (2014, p. 138) which can facilitate the growth of creativity.

The first key is explicitly teaching learners about creativity and creatives' lives. Who are prolific in creativity, what work do they do, and their personalities? Addressing such questions with information from the real world is considered a key to promoting creativity in the classroom. The second key is to teach creative methods, tools, and techniques, such as brainstorming. In other words, equip students with a toolbox that they use whenever they must. These tools are a knowledge base for creativity (especially in idea generation). The third key is to develop a classroom atmosphere that is safe and encouraging, an environment that promotes flexible thinking and discourages negativity.

Arthur Cropley (1997, p. 20) has described the characteristics of educators who are fostering creativity. There are nine distinct features of the creativity fostering educator:

1. Encouraging students to learn on their own, independently.
2. Has a style of teaching that is cooperative and socially integrative.
3. Motivates students to learn factual knowledge, which can be used later in divergent thinking.
4. Refrain judging ideas until students have thoroughly worked them out and ideas are formulated.
5. They encourage flexible thinking.
6. They encourage self-evaluation.
7. Suggestions and questions from students are taken seriously by them.
8. They provide opportunities where students to explore materials and pursue work under many different conditions.
9. They side with the students and help them deal with frustration and failure, to develop the courage to try different and unusual things.

(Pruitt, 1989) suggests that the creative process can be encouraged when the classroom instructors are willing to commit in three areas: 1) avoiding emphasis on conformity, 2) Avoid tying learning into small units that work like tidy, neat packages, and 3) Allow freedom to students and avoid being (too much) to control their progress and learning.

5.13 Is idea generation a skill or an ability?

Idea generation can be regarded as a skill or as an ability. Practically, there is the little impact or difference in producing ideas referred to as idea generation regardless of which term one might choose. As such, this thesis gives little importance to the matter. However, for clarity, both terms are shortly explained below. According to the dictionary, ability refers to doing something, and skill is the ability to do something well²³. The distinction can be less apparent in other examples, say driving. Many people can drive (ability), but few have specialised driving skills, like driving in steep terrain or racing (skill). Similarly, many people can run (ability), but few have mastered running to complete marathons (skill).

When referring to idea generation as an ability, it is something that (hypothetically) everybody can do to some extent. However, when idea generation is seen as a skill, it can be regarded as an ability to do well. Learners, most likely, grow their ability to generate ideas throughout their education. Presumably, by the time they graduate, their ability to generate ideas has transformed into a skill.

²³ 10th edition, Hornby, Albert S., Diana Lea, and Jennifer Bradbery. *Oxford Advanced Learner's Dictionary of current English*. Oxford: Oxford University Press, 2020. App.

6. Conceptual framework

This section draws upon literature and lists personality traits that affect creativity. This list contributes to developing the conceptual framework for two studies in this dissertation (first and second studies). Before providing the conceptual framework details, what conceptual framework means in this dissertation should be noted. There is confusion among theoretical and conceptual frameworks throughout the academic literature. Often, researchers do not explain what they mean by the 'conceptual' or 'theoretical' framework (Green, 2014). This dissertation adopts a conceptual framework.

Sitwala Namwinji Imenda (2014) has explored the differences between conceptual and theoretical frameworks and offers a detailed account. The discussion on what is and what is not a conceptual or theoretical framework is not in the scope of this dissertation. Nonetheless, Imenda's contribution helps to provide clarity. He argues that conceptual frameworks are associated with qualitative research (even though this PhD adopts a mixed-method, and relies primarily on a qualitative approach), and theoretical frameworks are associated with quantitative research. Despite these associations, both types of frameworks serve the same purposes (Imenda, 2014):

- a) to help the researcher to familiarise themselves with variables and concepts in a study,
- b) to provide the researcher with a general research approach (methodology – research design, target population and research sample, data collection and analysis), and
- c) to guide the researcher in data collection, interpretation, and analysis.

Considering the qualitative approach that this dissertation is taking, the conceptual framework deems to be appropriate.

6.1 Conceptual framework diagram

This study's scope explores educators' perceptions about idea generation in the design education context. The underlying assumption is that students attend a design school, which in the timespan of a few years (the duration of a graduate program) improves their ability to generate ideas. This improvement happens in various means, namely through inductive teaching-learning methods²⁴ of teaching and learning, impacting several personality characteristics.

Treffinger et al. (2002) have identified through literature several characteristics of creative personalities (precisely 37) and have categorised them into four categories. These four categories are explained below. Each category includes several characteristics/factors, and each one of the factors is defined and explained further in the following chapters. This categorisation is not crucial for this dissertation, but rather what is in those categories. In other words, the content that they categorise is of great importance. Table 9 on page 83 is a unified list of all the characteristics/factors.

Nonetheless, the four categories are

- Generating Ideas, which refers to *divergent thinking*,
- Digging Deeper into Ideas, which refers to *convergent thinking*,
- Openness and Courage to Explore Ideas, which refers to *personality characteristics*, and
- Listening to One's Inner Voice, which refers to an understanding of the self, or a general sense of *maturity*.

²⁴ Inductive teaching and learning refer to instruction being student-centred, letting students find rules. Contrary to inductive teaching and learning is deductive teaching and learning, in which the instructor gives directions to students.

Figure 11 below illustrates the conceptual framework and the sequence of all individual parts of the literature, guiding the three studies for this dissertation. The dashed content (the arrow directed towards students) is beyond the scope of this study. Nonetheless, even though students have not been included in this study, ultimately, this research is about students and the gradual improvement of their abilities.

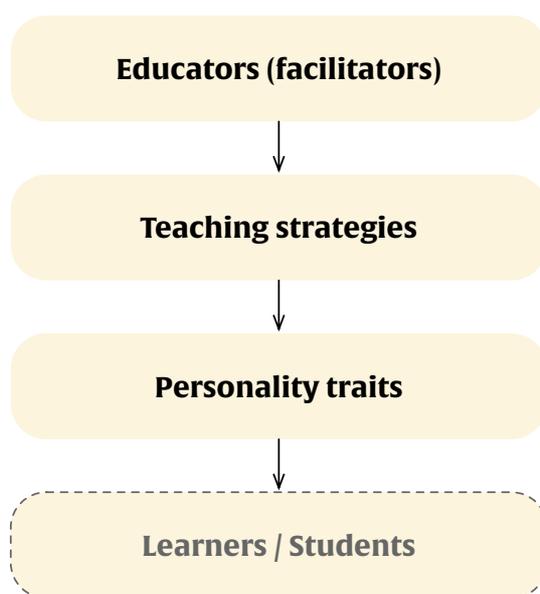


Figure 11. Conceptual framework of the study

The components or the conceptual framework shown in *Figure 11* are explained in this section. This figure may create the illusion of a top-down educational approach, implying that educators dictate the learners and instruct them on how to learn. That is not the case, especially in a constructivist approach. According to constructivism, learners construct knowledge upon themselves. Education is student-centred, and educators are not teachers who dictate. They are facilitators who create learning experiences, and this is what the conceptual framework figure portrays, the effect caused by the educators (facilitators).

Students (the recipient of the phenomenon studied) typically spend three to four years depending on the undergraduate program. In this environment, their educators (facilitators) use teaching strategies to help students transform into design professionals. These teaching strategies influence the students' personalities by invoking or growing certain personality traits. These traits presumably have a long-lasting effect on the students. The population sample for this has been a few hundred design educators, who were asked to provide their opinion about teaching strategies and personality traits.

While this doctoral thesis's research design did not incorporate student data collection, it ultimately documents the students' desired effect. The desired effect is to identify the pedagogical methods that improve the idea generation of the students. It deems appropriate to portray the students at the conceptual framework diagram as they are the recipient of the studied phenomena.

To summarise, there are three foundational components in the conceptual framework (four if students are counted as a component).

A) The educators are responsible professionals who deploy (facilitate) various teaching strategies.

B) the various teaching strategies being used, and

C) the personality traits affected by the teaching strategies and contribute to the ability to generate ideas. Lastly,

D) the final recipients of the phenomenon being studied are the students.

6.2 Personality traits affecting creativity

Table 9 on page 83 displays alphabetically various personality traits identified by Treffinger et al. (2002) in their respective categories. For clarity, the titles of the categories have been replaced with academic terminology (which is partially provided by Treffinger, the original author). Treffinger et al. have identified one more characteristic that belongs to convergent thinking, which is evaluating ideas. This characteristic has been deliberately excluded in the study, as evaluation does not belong to the idea generation phase. Instead, it happens after idea generation has occurred therefore it was deemed as an irrelevant metric to deploy on the surveys. Finally, technically not a component, but the recipient of the phenomena studied, are the students.

Please note that as this PhD project has been a long-term pursuit, the personality trait 'labels' have been slightly rephrased over the years as an effort to improve their clarity. The concepts or definitions of these traits (sometimes addressed as 'factors' or 'characteristics' throughout the text) have remained intact since the beginning. However, the labels have been changed to a form that grammatically resembles *adjectives*. This was done as adjectives are better descriptors for an individual. All traits in this dissertation are provided in their final adjective format, except in the Methodology section, which explicitly provides information regarding the first and third studies. This was done to preserve the initial format initially presented to the participants.

How this conceptual framework serves this doctorate

Table 9. Definitions Of Personality Traits

ABSORBED IN WORK	Losing sight of time and place when working on a project
ADAPTIVE	Using, making, and doing with what is at hand to achieve goals
ABLE TO SEE RELATIONSHIPS	Able to see connections between unrelated ideas.
ABLE TO SYNTHESISE	Tanking thoughts and creating mental structures and patterns, to create new, intriguing possibilities.
AESTHETIC SENSITIVITY	Appreciating and preferring the elegance of form and thought.
ANALYTICAL	Breaking down and deconstructing information and ideas into smaller parts, to draw conclusions
ELABORATIVE	Expanding and enriching ideas with details, making them more interesting and complete
ENERGETIC	Able to show great activity or vitality in the work
FLEXIBLE	Able to shift the direction of one's thinking or to change one's point of view.
FLUENT	Able to generate a large volume of ideas when responding to an open-ended question. Aiming for quantity rather than quality.
HARD-WORKING	Concentrating intensely on a subject or problem of interest.
HIGHLY CURIOUS	Being interested and asking many unusual and varied questions.
HUMOROUS	Having a sense of humour which can appear others as silly or immature.
IMAGINATIVE	Able to form mental images that are not perceived as real to the senses and have the capacity for fantasy
INDEPENDENT OF THOUGHT	Unafraid to be different or to express alternative points of view
INTEGRATIVE OF DICHOTOMIES	Possessing conflicting characteristics, for example, being traditional and forward-thinking, being an introvert and extrovert, being humble and proud.
INTOLERANT OF AMBIGUITY	Reviewing ideas with a constructive approach rather than a destructive approach.
INTUITIVE	Having the confidence to stand up for beliefs and follow instincts.

(continued)

(continued) Table 9. Definitions of personality traits

METAPHORIC THINKER	Comparing or using analogies to make new connections, to discover new possibilities.
OPEN TO EMOTIONS	Being aware of passions and convictions and using this awareness in the creative process
OPEN TO EXPERIENCE AND IDEAS	Having courage and being eager to pursue experiences and ideas that others do not see as valuable.
ORIGINAL	Generating statistically infrequent, innovative ideas.
PERCEIVE THE SELF AS CREATIVE	Believing in their creative ability and having the desire and self-confidence to create.
PERSISTENT OR PERSEVERANT	Carrying on when things are not yet working.
PLAYFUL	Finding amusement and enjoying creative work and sometimes not taking things too seriously. Can appear to others as silly or immature.
PREFERRING COMPLEXITY	Gathering a large amount of information (more than what is needed) to understand the problem better.
QUESTIONING OF AUTHORITY	Able to critically examine and challenge authoritarian pronouncements, such as teachers and market leaders.
RECLUSIVE	Tending to be alone to be productive and sometimes coming across as absent-minded, lost or anti-social.
REORGANISING OR REDEFINING	Sorting and arranging ideas in a more meaningful way.
RISK-TAKING	Challenging assumptions or the status quo and feeling comfortable with risk
SELF-DISCIPLINED	Accepting responsibility for actions and enthusiastically looking for opportunities to apply creativity.
SENSITIVE TO PROBLEMS	Being aware and sensitive to existing problems
SUPPORTING OF GENDER EQUALITY	Tending to have a gender-bias-free attitude.
TOLERANT OF AMBIGUITY	Being unafraid of the unknown and being comfortable with not knowing where an idea might lead to.
UNINHIBITED IN EXPRESSING AN OPINION	Being unafraid to express opinions, beliefs, or unpopular ideas.
WILLING TO GROW	Being eager to convert negatives into positives and perceiving obstacles as challenges.

6.3 Divergent thinking

Divergent thinking refers to the thought process or the abilities to generate many ideas. Guilford identified these abilities as divergent production abilities, whereas Torrance expressed them as creative thinking dimensions (Treffinger et al., 2002, p. 11). Divergent thinking is tied to creative potential essentially because it indicates a person's ability to be original, fluent and flexible with ideas (Runco, 2013a, p. 35).

The table below showcases the personality characteristics that are identified by Treffinger et al. (2002).

Table 10. Generating ideas – Divergent thinking

<i>Elaborative</i>	<i>Expanding and enriching ideas with details, making them more interesting and complete.</i>
<i>Flexible</i>	<i>Able to shift the direction of one's thinking or to change one's point of view.</i>
<i>Fluent</i>	<i>Able to generate a large volume of ideas when responding to an open-ended question. Aiming for quantity rather than quality.</i>
<i>Metaphoric thinker</i>	<i>Comparing or using analogies to make new connections, to discover new possibilities.</i>
<i>Original</i>	<i>Generating statistically infrequent, new ideas.</i>

6.3.1. Elaborative

Operational definition:

‘Expanding and enriching ideas with details, making them more interesting and complete’

Table 11. Elaborative, as discussed by various authors

<i>(Kneller, 1965, p. 64)</i>	<i>Creativity is about novelty and following up on ideas, adding details, and making them happen.</i>
<i>(Ellis Paul Torrance, 1963, p. 8)</i>	<i>Being able to fill in the details.</i>
<i>(E. Paul Torrance, 1962, p. 47)</i>	<i>Elaboration is building on the basic idea to make it more exciting and to tell a story</i>
<i>(Stein, 1962, p. 86)</i>	<i>Is determined by labour, concentration, and endeavour</i>
<i>(Mooney & Razik, 1967, p. 192)</i>	<i>Ideas or solutions make no difference unless someone elaborates and works out the required plans for execution.</i>
<i>(Starko, 2014, p. 64)</i>	<i>Elaboration is about adding to ideas to improve them.</i>
<i>(Schlichter, 1978)</i>	<i>Elaboration involves embroidering upon or strengthening ideas and adding more detail.</i>
<i>(Piiro, 2011, p. 134)</i>	<i>Elaboration is about focusing on details, amplifying, expanding, and embellishing.</i>
<i>(Davis 2004, p. 101)</i>	<i>Elaboration is the essential ability to detail to an idea, including developing, improving, enhancing, and executing the idea</i>

6.3.2. Flexible

Operational definition:

'Able to shift the direction of one's thinking or to change one's point of view.'

Table 12. Flexible, as discussed by various authors

<i>(Amabile, 1983)</i>	Flexibility is producing a large variety of ideas.
<i>(Davis 2004, p. 101)</i>	Flexibility can view a problem from multiple angles, think of ideas in diverse categories, or approach a problem from a distinct perspective.
<i>(Joy Paul Guilford, 1987)</i>	The flexibility of the mind is a creativity factor that could be assessed independently
<i>(Kneller, 1965, p. 40)</i>	Semantic spontaneous flexibility is "the ability or disposition to produce a diversity of ideas, when free to do so." Figural spontaneous flexibility is the "tendency to perceive rapid alternations in perceived visual figures."
<i>(Kaufman, 2016, p. 72)</i>	Flexibility is the ability to generate many distinct types of ideas
<i>(Piiro, 2011, p. 134)</i>	Flexibility is the ability to categorise and classify
<i>(Starko, 2014, p. 105)</i>	the ability to look at a situation from multiple points of view.
<i>(Wycoff, 1991, p. xvi)</i>	The human mind has limitless potential for idea generation. It works best when we allow ideas to flow before trying to make any sense of them freely
<i>(Ellis Paul Torrance, 1963, p. 8)</i>	To produce a variety of ideas or use multiple approaches to produce ideas
<i>(Schlichter, 1978)</i>	Flexibility involves thinking of various kinds of ideas or striking out in new directions

6.3.3. Fluent

Operational definition:

'Able to generate a large volume of ideas when responding to an open-ended question. Aiming for quantity rather than quality.'

Table 13. Fluent, as discussed by various authors

<i>(Joy Paul Guilford, 1959, 1987)</i>	A person who can produce many ideas in a fixed amount of time has a higher chance to generate significant ideas.
<i>(Kneller, 1965, p. 39)</i>	Fluency is being able to produce words rapidly, fulfilling specific symbolic requirements.
<i>(Kaufman, 2016, p. 72)</i>	Fluency is being able to produce a significant number of ideas, and elaboration develop further these ideas
<i>(Schlichter, 1978)</i>	fluency which involves thinking of many ideas or solutions and producing several possibilities
<i>(Starko, 2014, p. 146)</i>	'Fluency often is the basis of activities designed to improve divergent thinking. The more ideas you have, the more likely it is that at least one of them will be a good idea.'
<i>(Ellis Paul Torrance, 1963, p. 8)</i>	Producing a large volume of ideas
<i>(Davis 2004, p. 101)</i>	Fluency is the ability to produce many verbal or nonverbal ideas for a problem or question open-ended. Pseudonyms include associational fluency and ideational fluency.
<i>(Hanks, 1991, p. 77)</i>	New creative ideas are often a combination of existing ideas. The more (existing) ideas that your head has, the more connections you will make. Moreover, consequently, the more creative you will be able to be.

6.3.4. Metaphoric thinker

Operational Definition:

'Able to generate a large volume of ideas when responding to an open-ended question. Aiming for quantity rather than quality.'

Table 14. Metaphoric thinker, as discussed by various authors

<i>Aristotle</i>	Aristotle regarded metaphorical thinking as a characteristic of geniuses, and he said that "the greatest thing by far is to be the master of metaphor."
<i>(Brinck, 1997, p. 16)</i>	Can also be labelled as a superimposition of representations.
<i>(Starko, 2014, p. 104)</i>	Creative people often can connect and draw parallels between unlike ideas, and metaphorical thinking makes it possible to use one idea to express another.
<i>(Proctor, 2014a, p. 184)</i>	Connecting two different universes of meaning.
<i>(Von Oech, 1983, p. 36)</i>	A metaphor is a mental map, and the key to metaphorical thinking is similarity. A map of Salt Lake City is not Salt Lake City (and yet it is).
<i>(Lewis, 2005, p. 39)</i>	Metaphors are powerful creative tools that permit the categorization and comparison of materially distinct entities.
<i>(G. M. Prince, 1970, p. 79)</i>	Metaphorical thinking is valuable in accomplishing creative solutions by encouraging each group member to think and venture into seemingly unconnected areas to the problem.
<i>(Liedtka & Ogilvie, 2011, p. 66)</i>	Metaphorical thinking is the method to recognize a connection between two seemingly unrelated things
<i>(Kneller, 1965, p. 64)</i>	The creative person is unusually fluent because he can produce more ideas on a subject than the ordinary person.

6.3.5. Original

Operational definition:

'Generating statistically infrequent, new ideas.'

Table 15. Original, as discussed by various authors

<i>(E. Paul Torrance & Safter, 1999, p. 91)</i>	Originality is about the statistical infrequency of response concerning all of the responses to the identical test task produced by a large group of people
<i>(Rietzschel et al., 2010, p. 48)</i>	Originality is a characteristic of creative behaviour. It would not be creative if the ideas were not new or unusual
<i>(Getzels & Csikszentmihalyi, 1976, p. 112)</i>	Originality is what provides value to a work of art
<i>(Kneller, 1965, p. 40)</i>	The ability or disposition to generate unusual or remotely associated or witty answers to a problem.
<i>(Runco, 2014, p. 393)</i>	Originality may perhaps take the form of novelty, unusualness, uniqueness, or unconventionality.
<i>(Kaufman, 2016, p. 71; Ellis Paul Torrance, 1963, p. 8)</i>	Being able to produce unusual ideas.
<i>(G. Davis, 2011)</i>	The trait of originality is so fundamental that dictionaries often use it interchangeably with creativity. Originality may also be considered a creative ability to sense one's capacity for uniqueness and nonconformity in thinking.
<i>(Starko, 2014, p. 330)</i>	A person's ability to differentiate ordinary from original ideas can be a sign of creative ability

6.4 Convergent thinking

Convergent thinking is a (form of) thinking required, notably when someone needs to find the conventional or correct answer to a question, or perhaps a solution to a problem (Runco, 2013b, p. 67). The emphasis is the speed and logic, as well as the accuracy and recognition of anything known. Accumulating information and applying methods or techniques to reach a suitable answer to a problem are also essential factors in convergent thinking (A. Cropley, 2006, p. 391). While divergent thinking refers to the ability to generate many ideas, convergent thinking, on the contrary, is the ability to focus on discovering which idea is good (Mahmoud et al., 2020, p. 191). Both types of thinking (convergent and divergent) are considered to be involved in creative thinking (Goldschmidt, 2014, p. 46), and both are important, each on its own merit.

The table below showcases the personality characteristics that are identified by Treffinger et al. (2002).

Table 16. Convergent thinking - Digging Deeper into Ideas

<i>Analytical</i>	<i>Breaking down and deconstructing information and ideas into smaller parts, in order to draw conclusions</i>
<i>Intolerant of ambiguity</i>	<i>Reviewing ideas with a constructive approach rather than a destructive approach.</i>
<i>Preferring complexity</i>	<i>Gathering a large amount of information (more than what is needed) to understand the problem better.</i>
<i>Reorganizing or redefining</i>	<i>Sorting and arranging ideas in a more meaningful way.</i>
<i>Able to see relationships</i>	<i>Able to see connections between unrelated ideas.</i>
<i>Able to synthesise</i>	<i>Tanking thoughts and creating mental structures and patterns, to create new, intriguing possibilities.</i>

6.4.1. Analytical

Operational definition:

'Breaking down and deconstructing information and ideas into smaller parts, in order to draw conclusions'

Table 17. Analytical as discussed by various authors

(Adair, 2007, p. 68)	<i>Breaking down into pieces; resolving an entity into its fundamental components.</i>
(Vallée-Tourangeau, 2018, p. 7)	<i>Analytic thinking is best portrayed as a dynamic process that can lead to creative breakthroughs</i>
(Dacey, 1989, p. 253)	<i>Being able to solve problems logically.</i>
(Massialas & Zevin, 1983, p. 7)	<i>Analytical reflection is guided by thinking of the solution to a problem. It creates alternatives and sets controls to check the accuracy of propositions. It also helps relating them to a familiar body of theory.</i>

6.4.2. Intolerant of ambiguity

Operational definition:

'Reviewing ideas with a constructive approach rather than a destructive approach'

Table 18. Intolerant of ambiguity, as discussed by various authors

<i>(Sternberg, 1995, p. 224)</i>	To enhance creative potential, people need to have the ability to tolerate the discomfort of an ambiguous situation. They need to do so long enough, so what they produce is as close to the best of their abilities.
<i>(Hoorn, 2014, p. 264)</i>	Certain people consider ambiguity as an opportunity. They aim to seek out such opportunities, incite novel ideas, and resolve those contradictions to generate win-win results.
<i>(Von Oech, 1983, p. 78)</i>	The ability to discover ambiguity is an essential part of thinking something different.
<i>(Von Oech, 1983, p. 85)</i>	Many have learned to "avoid ambiguity" to avoid communication problems that it may cause. It is a good idea in practical circumstances where the consequences of a misinterpretation could be pretty severe. In the creative context, though, there is the danger that being too specific can suppress imagination.

6.4.3. Preferring complexity

Operational definition:

‘Gathering a large amount of information (more than what is needed) to understand the problem better.’

Table 19. Preferring complexity, as discussed by various authors

<i>(Davis 2004, p. 90)</i>	<i>Creative people are attracted to complexity, ambiguity, and fantasy. They are also attracted to the mysterious, and this is a tendency that may indicate the creative person's complexity.</i>
<i>(Yu & Lee, 2020, p. 58)</i>	<i>Creatives prefer disorder, and this does not mean creative people have a chaotic lifestyle. Instead, it means that they tend to enjoy bringing order out of disorder as a challenge.</i>
<i>(Perkins, 1981, p. 279)</i>	<i>Why does creating becomes complicated? The most straightforward answer is that because we do what we have to.</i>
<i>(Starko, 2014, p. 118)</i>	<i>Complexity might offer one explanation for conflicting lists of characteristics and experiences credited to creative individuals.</i>

6.4.4. Reorganizing or redefining

Operational definition:

'Sorting and arranging ideas in a more meaningful way.'

Table 20. Reorganizing or redefining, as discussed by various authors

<i>(J. P. Guilford, 1950, p. 453)</i>	Creative thinking involves much organizing of ideas into more significant, more inclusive patterns.
<i>(Basadur et al., 2012, p. 671)</i>	Adaptability is a proactive process. Looking for approaches to deliberately change in a planned way also involves responding quickly to unforeseen events to maintain routines, as little disruption as possible, and creatively exploiting such occurrences.
<i>Zach Dodson (McGuinness & Design Assembly, 2020)</i>	"It is important to know how to learn, and that is how we can help – how to pick up a new skill. It is valuable because, in ten to twenty years, you will need to change too. So, adaptability is important."

6.4.5. Able to see relationships

Operational definition:

‘Able to see connections between unrelated ideas.’

Table 21. Able to see relationships, as discussed by various authors

<i>(Hanks, 1991, p. 107)</i>	Novel and different relationships among ideas can result in additional ideas. That is the case only if all ideas are seen together.
<i>(Fisher, 2016, p. viii)</i>	As the systems that we depend on are quickly approaching tipping points, novel ways of thinking and acting are needed more than ever. That is where design thinking can be pretty helpful. It offers not only a rigorous process of producing creative ideas, but it is also a synthesizing, all-inclusive way of looking at the world, making connections and seeing relationships between things that are considered and treated as separate and distinct.
<i>(Mishra & Henriksen, 2018, p. 60)</i>	Designers play games on their minds, explore possibilities, work across disciplinary boundaries, and see connections and ways of thinking that cut across them. From there, their knowledge creativity can generate a wide-ranging spectrum of concepts. This broad-spectrum can range from an ordinary piece of work similar to existing work, something that feels unique and fresh. Nevertheless, it still has evident roots in a pre-existing thing, to something that feels very different and inventive that it becomes hard to know where the inspiration came from.
<i>(Nielsen, 2016, p. 18)</i>	Good creative idea people are also good at seeing connections. By training the ability to see connections, one can enhance his or her capacity to think creatively.

6.4.6. Able to synthesise

Operational definition:

'Tanking thoughts and creating mental structures and patterns, to create new, intriguing possibilities.'

Table 22. Able to synthesise, as discussed by various authors

<i>(Adair, 2007, p. 69)</i>	Synthesising is assembling a complicated union of elements, especially developing concepts, general ideas and theories.
<i>(Dellas & Gaier, 1970, p. 60)</i>	Creative individuals can incorporate the richness of experience into a higher-order synthesis that makes for the extraordinary and uncommon in creative production or performance.
<i>(J. P. Guilford, 1950, p. 453)</i>	Creative thinking involves much organizing of ideas into more distinctive, more inclusive patterns.
<i>(Reiter-Palmon et al., 2019, p. 533)</i>	Listening carefully to other people's ideas or combining ideas with others' ideas can enhance organisational creativity.

6.5 Personality characteristics

There is a romantic view held by society that creative individuals are geniuses (R. Weisberg, 1986, p. 1). Nonetheless, Robert Weisberg questions this notion by arguing that creative people in a given sector may not necessarily possess different characteristics than less-creatives. He also argues that creativity is not expressed consistently, even by the most reputable scientists or artists, indicating that creative genius is not a constant characteristic (R. Weisberg, 1986, p. 88).

While some characteristics are often attributed to creative people, it is essential to acknowledge that people are different. Their creativity characteristics will adapt according to the person. It can be explained that some creative people prefer to stay alone and live a monastic life, to produce creative work in isolation. In contrast, some other creative people are very social and thrive in a buzzing world, producing a high creative output volume despite being in the spotlight.

These personality characteristics can be phrased as personality traits. These are qualities that an individual may possess. There are hundreds of such qualities, and various scholars have compiled lists with the traits that affect creative people. Two such lists were presented earlier in this dissertation²⁵ (please look at [Table 82 on page 324](#) and also at [Table 83 on page 325](#)).

The table below showcases the personality characteristics that are identified by Treffinger et al. (2002).

²⁵ Please also note that there are negative personality traits of creative people as well or pathological characteristics. These characteristics are not included in the tables mentioned above, as the objective of this PhD is improving the ability to generate ideas, as such it examines the characteristics that are perceived to be neutral or positively impactful to a creative personality. Nonetheless, interested readers can read an exemplary list with negative traits on the appendix [Appendix 5 – Negative traits on page 267](#)

Table 23. *Openness to Explore Ideas*

<i>Adaptive</i>	Using, making, and doing with what is at hand in order to achieve goals.
<i>Aesthetic sensitivity</i>	Appreciating and preferring the elegance of form and thought.
<i>Imaginative</i>	Able to form mental images that are not perceived as real to the senses and have the capacity for fantasy
<i>Highly curious</i>	Being interested and asking many unusual and varied questions.
<i>Integrative of dichotomies</i>	Possessing conflicting characteristics. For example being traditional and forward-thinking, being an introvert and extrovert, being humble and proud.
<i>Intuitive</i>	Having the confidence to stand up for beliefs and follow instincts.
<i>Open to emotions</i>	Being aware of passions and convictions and using this awareness in the creative process
<i>Open to experience and ideas</i>	Having courage and being eager to pursue experiences and ideas that others do not see as valuable.
<i>Playful</i>	Finding amusement and enjoying creative work and sometimes not taking things too seriously. Can appear to others as silly or immature.
<i>Sensitive to problems</i>	Being aware and sensitive to existing problems
<i>Risk-taking</i>	Challenging assumptions or the status quo and feeling comfortable with risk
<i>Humorous</i>	Having a sense of humour which can appear others as silly or immature.
<i>Uninhibited in expressing an opinion</i>	Being unafraid to express opinions, beliefs or unpopular ideas.
<i>Tolerant of ambiguity</i>	Being unafraid of the unknown and being comfortable with not knowing where an idea might lead to.
<i>Questioning of authority</i>	Able to critically examine and challenge authoritarian pronouncements, such as teachers and market leaders.
<i>Willing to grow</i>	Being eager to convert negatives into positives and perceiving obstacles as challenges.

6.5.1. Adaptability

Operational definition:

'Using, making, and doing with what is at hand in order to achieve goals'

Table 24. Adaptability, as discussed by various authors

<i>(Csikszentmihalyi, 1996)</i>	Creative people have a remarkable characteristic to adapt to any situation.
<i>(A. J Copley, 1969, p. 43)</i>	Creative thinkers are flexible and adaptable in their intellectual functioning. They are not committed to preserving the status quo and are prepared to reorder their thinking.
<i>(Barron, 1988, p. 80)</i>	Creativity is the ability to react adaptively to the needs for new approaches and new products. Essentially it is the ability to bring something new purposefully into existence.
<i>(Hanks, 1991, p. 40)</i>	Instead of searching for something completely new, creators look at existing things and examine if they can adapt them to their needs. Successful creative solutions are every so often an adaptation or an extra modification to an existing thing.

6.5.2. Aesthetic sensitivity

Operational definition:

‘Appreciating and preferring the elegance of form and thought.’

Table 25. Aesthetic sensitivity, as discussed by various authors

<p><i>(Davis 2004, p. 91)</i></p>	<p><i>Creative people typically consider themselves "artistic," regardless they can draw or not. Creative people tend to be more aware of artistic considerations, and they also have aesthetic interests. They are attracted to music, dance concerts, art galleries, photo exhibits, plays, antique shows, a good sunset, masterpieces at the theatre, scenic views from the highway, and so forth. One apparent reason for above-average aesthetic and artistic interests is that creative people are much more likely to be involved in artistic and aesthetic enterprises such as music, theatre, art, crafts, etc.</i></p>
<p><i>(Dudek & Côté, 1994, p. 144)</i></p>	<p><i>Aesthetic sensibility continues to be an intuitive mode of sensing, judging, feeling, and organizing.</i></p>
<p><i>(D. MacKinnon, 1971, p. 205)</i></p>	<p><i>Indeed creative people are not satisfied with the solutions to problems unless they are aesthetically pleasing and elegant. Work has to be simultaneously true and beautiful. The aesthetic viewpoint infuses a lot in the work of the creative person.</i></p>

6.5.3. Imaginative

Operational definition:

‘Able to form mental images that are not perceived as real to the senses and have the capacity for fantasy ‘

Table 26. Imaginative, as discussed by various authors

<i>Albert Einstein (1879-1955)</i>	<i>“Imagination is more important than knowledge. Knowledge is limited. Imagination encircles the world.”</i>
<i>(Csikszentmihalyi, 1996)</i>	<i>Creative people leap into another world, an imaginative world that differs from the present</i>
<i>(Seelig, 2017, p. 48)</i>	<i>Creativity is based on imagination. Nothing will happen with envisioned goals unless there is motivation to experiment and find creative ways to reach them.</i>
<i>(G. J. W. Smith & Faldt, 1999)</i>	<i>Indulging in fantasy is regarded as a description of very creative people</i>
<i>(E. Paul Torrance, 1962, p. 13)</i>	<i>Fantasy should be kept alive until a child's intellectual development is at the level that the child can engage in firm creative thinking.</i>

6.5.4. Questioning of authority

Operational definition:

‘Able to critically examine and challenge authoritarian pronouncements, such as teachers and market leaders.’

Table 27. Questioning of authority, as discussed by various authors

<i>(E. Paul Torrance, 1962, p. 63)</i>	Highly creative individuals have a preference to learn creatively instead of authority. When they are allowed to learn in this way, they perform as good as their more intelligent but not creative peers.
<i>(A. J Cropley, 1969, p. 63)</i>	Considering the behavioural traits of highly divergent people, they are likely to be adventurous and unwilling to accept authority. They are unorthodox and are likely to ask awkward questions, be humorous, and so on.
<i>(Kneller, 1965, p. 67)</i>	Those people who conform (to authority) the most are generally the least creative. Conformity inhibits the personality traits and characteristics that make for creativity.
<i>(Eyring, 1959, p. 4)</i>	Even gifted individuals require a stimulating environment free from distractions and free from an authoritarian society which inhibits unbiased inquiry. They need to be independent of all types of vicious cycles, which prevent attention from the problem at hand.

6.5.5. Highly curious

Operational definition:

'Being interested and asking many unusual and varied questions.'

Table 28. Highly curious, as discussed by various authors

<i>(G. Davis, 2011)</i>	Creative people sometimes have a childlike sense of wonder and a desire to understand the world. They might have a history of taking things apart, investigating how they work and exploring libraries, attics and museums.
<i>(Joy Paul Guilford, 1987)</i>	Creative people desire to accumulate and learn information, which plays a role in building a well-stocked memory needed in productive thinking.
<i>(Starko, 2014, p. 113)</i>	Creative people are curious. They want to know how people think, how things work, what is out there, and how it got to where it is. They retain the childlike persistence and keep asking "Why?" on every occasion.
<i>(E. Paul Torrance, 1962)</i>	Education teaches that "curiosity killed the cat". Nonetheless, the curious cat is carefully testing the limits of a dangerous situation. The curious person is never idle.
<i>(Eells, 1934)</i>	"The classroom is not the birthplace of curiosity, but its tomb and nothing in the world is so conservative as the academic mind, nothing so frightened by a new idea."

6.5.6. Integrative of dichotomies

Operational definition:

'Possessing conflicting characteristics. For example being traditional and forward-thinking, being an introvert and extrovert, being humble and proud.'

Table 29. Integrative of dichotomies, as discussed by various authors

<i>(Barron, 1969)</i>	Creative people are smart and naive simultaneously. They have a sense of pride but are also bumble. They can be childish and wise, rebellious, and conservative. They do tend to be on multiple ends.
<i>(Cramond, 1995)</i>	In some instances, the qualities that cause problems to some creative individuals are the same ones that contribute to their creative accomplishments.
<i>(Hilton, 2010, p. 134)</i>	When creativity has no boundaries, creative processes may identify and opportunities for good or evil evenly. The concept of good and evil is essentially a human construct relating to helping or harming.

6.5.7. Intuitive

Operational definition:

'Having the confidence to stand up for beliefs and follow instincts.'

Table 30. Intuitive, as discussed by various authors

<i>(Dacey, 1989, p. 8)</i>	Creativity is regularly linked to intuition, which is the ability to solve problems using the subconscious.
<i>(Starko, 2014, p. 102)</i>	Creative people often look for hidden meanings, potential, metaphors, alternate uses, or implications in the things they experienced.
<i>(Kneller, 1965, p. 30)</i>	The deliverances of their unconscious do not control creative people; instead, they use them. They know they can return to reality. Many emotionally disturbed persons who are considered creative deny therapy as they fear that it may kill their creativity once their emotional problems are solved.
<i>(Davis, 2011; 2004, p. 91)</i>	Intuitiveness and perceptiveness include a creative person's higher sensitivity to "what should follow", details, patterns and implications. Creative people are faster to see relationships and make such "mental leaps." This perceptiveness and intuition relate to the problem-finding ability and insightfulness of creative people.
<i>(Piirto, 2011, p. 100)</i>	Intuition is "Just knowing," having a gut feeling. Everyone has intuition, but many people do not have a fair on their intuition.

6.5.8. Uninhibited in expressing an opinion

Operational definition:

‘Being unafraid to express opinions, beliefs or unpopular ideas.’

Table 31. Uninhibited in expressing an opinion, as discussed by various authors

<i>(Gutman, 1967, p. 3)</i>	Creative behaviour naturally is spontaneous and inner-directed. It is unpredictable and escapes manipulation and control. Generally, it is not amenable to experimentation.
<i>(Rogers, 1954)</i>	Expressing the ridiculous and being spontaneous arises an intuitive, creative seeing of life in

6.5.9. Open to emotions

Operational definition:

'Being aware of passions and convictions and using this awareness in the creative process'

Table 32. Open to emotions, as discussed by various authors

<i>(Davis 2004, p. 91)</i>	The syndrome includes having deep emotions, experiencing emotional highs and lows, and moodiness and-emotional sensitivity. Other traits of the emotionally gifted include high psychomotor activity (e.g., high energy, fast-talking), a severe concern for right-and-wrong (moral thinking), and aliveness of sensual experiences.
<i>(Stein, 1974, p. 59)</i>	Creative individuals are open to feelings and emotions. To them, feeling is more important than thinking. They possess vitality and enthusiasm and are more subjective.
<i>(Stein, 1974, p. 33)</i>	Creative individuals often experience a feeling of exhilaration when they are completing a creative product. They are ready to shout, "Eureka!". Part of this feeling relates to the release of emotions that had to be controlled not to disturb the work's progress.

6.5.10. Open to experience and ideas

Operational definition:

‘Having courage and being eager to pursue experiences and ideas that others do not see as valuable.’

Table 33. Open to experience and ideas, as discussed by various authors

<i>(Dacey, 1989, p. 11)</i>	A vital aspect of creativity can receive new information without prejudice
<i>(Linkner, 2011, p. 71)</i>	The most successful creative minds do not fear failure. Instead, they keep experimenting until they stumble upon the most exceptional solutions. Thomas Edison created thousands of light bulb versions until he eventually created the one that changed the world.
<i>(Starko, 2014, p. 114)</i>	To become curious, there must be something to be curious about. Creative people offer themselves constant sources of questions, problems, and ideas by being receptive to the experience. One aspect of openness to experience is being receptive to the complicated input of all the senses.
<i>(Starko, 2014, p. 61)</i>	Openness to experience means willing to view experiences beyond traditional categories and to consider new ideas.
<i>(G. Davis, 2011)</i>	By definition, a creative person should be receptive to new ideas and willing to look at problems from multiple angles. Being open-minded includes not fearing the unknown, new, or different. It also means not making up your mind in advance.

6.5.11. Playful

Operational definition:

‘Finding amusement and enjoying creative work and sometimes not taking things too seriously. Can appear to others as silly or immature.’

Table 34. Playful, as discussed by various authors

<i>(Csikszentmihalyi, 1996)</i>	Creative people typically have a playfully light attitude.
<i>(Starko, 2014, p. 143)</i>	Playfulness is not the same as silliness. It entails thinking about things just for fun. Playing with ideas provides the energy and motivation to ask new and exciting questions. It offers a counterweight to the “way too sophisticated to care” attitude that seems to permeate some youth cultures.
<i>(Hanks, 1991, p. 13)</i>	<p>Playful people are creative people. They frequently get elegant ideas just from playing around.</p> <ul style="list-style-type: none"> • Einstein enjoyed play games of imagination, riding beams of light. The eventual result of his playing was the theory of relativity. Einstein talked about “thought experiments.” • Galileo invented the telescope that as a toy for him. When he started using it, he realised how significant ‘toy’ it was.
<i>(Kneller, 1965, p. 65)</i>	Creative people naturally play with ideas as they produce more than ordinary people. The trait of playfulness relates to fluency. When creative people explore ideas, they are toying with them, and they can eventually lead them.
<i>(van Dijk et al., 2020)</i>	Playfulness can be observed in the made products, but it can also be considered an essential contribution to a problem-solving mindset.

6.5.12. Sensitive to problems

Operational definition:

‘Being aware and sensitive to existing problems’

Table 35. Sensitive to problems, as discussed by various authors

<p><i>(Dacey, 1989, p. 10)</i></p>	<p><i>It is a highly sensitive trait. The individuals who possess it appear to have a sixth sense, allowing them to dig into the heart of a situation. They understand what problems are out there before anyone else.</i></p>
<p><i>(Joy Paul Guilford, 1959, 1987)</i></p>	<p><i>In some cases, one (creative) individual will recognise several problems, whereas another (non-creative) individual will be unaware of them</i></p>
<p><i>(George & Wiley, 2020).</i></p>	<p><i>Although new ideas may be built upon or inspired by old ones, it is also crucial to escape the limitations of familiarity to produce new original ideas</i></p>
<p><i>(Tovey, 2015c, p. 62)</i></p>	<p><i>During the framing process, the problem can be viewed selectively in a certain way before moving on. Such a framing process can act as a kind of window of the problem.</i></p>
<p><i>(Rill, 2018, p. 213)</i></p>	<p><i>Throughout the idea generation phase, team members share their knowledge about various aspects of the issue and search for more information. By sharing and synthesizing, team members generate a new layer of collective knowledge on top of the pre-existing bits and pieces.</i></p>

6.5.13. Risk-taking

Operational definition:

'Challenging assumptions or the status quo and feeling comfortable with risk'

Table 36. Risk-taking, as discussed by various authors

<p><i>(G. Davis, 2011)</i></p>	<p><i>Independence and risk-taking interrelate closely as a person cannot exhibit high independence without the accompanying willingness to take a creative risk. Independence and risk-taking expose the creative person to potential embarrassment and criticism, and it becomes possible to look foolish or to fail.</i></p>
<p><i>(Joy Paul Guilford, 1987)</i></p>	<p><i>It has been said that many creative people are ready and willing to take risks. They are not afraid to be considered wrong, and they are willing to experiment with the "long shots".</i></p>
<p><i>(Starko, 2014, p. 110)</i></p>	<p><i>Creative risk is about being open to ridicule, criticism or having feelings of foolishness</i></p>
<p><i>(Sternberg, 2000)</i></p>	<p><i>Taking risks is one of the "decision characteristics" of creative people. It is contrary to the (American) educational system, which often encourages students to play it safe.</i></p>
<p><i>(E. Paul Torrance, 1962, p. 74)</i></p>	<p><i>Risk-taking is vital in the acquisition of skills and knowledge. Personality development and growth can arise only from variation and risk-taking.</i></p>

6.5.14. Humorous

Operational definition:

'Having a sense of humour which can appear others as silly or immature.'

Table 37. Humorous, as discussed by various authors

<p><i>(A. J Cropley, 1969, p. 44)</i></p>	<p><i>Creative people often exhibit a lively sense of humour and are often alert to the funny side of life. They are also terrific at delivering humorous responses to tests.</i></p>
<p><i>(Davis 2004, p. 90)</i></p>	<p><i>Many discoveries, solutions to problems, inventions, and artistic creations come from 'fooling around' and playing with remote possibilities, working with ideas, turning things upside down, inside out or backwards. It also relates to having a childlike and playful approach to problems.</i></p>
<p><i>(E. Paul Torrance, 1962, p. 249)</i></p>	<p><i>Creative people have the quality of depicting comical, amusing, and funny. They may make their audience laugh or smile.</i></p>
<p><i>(Kneller, 1965, p. 66)</i></p>	<p><i>The creative person has a sense of humour and can see more meanings in a situation than ordinary people cannot; many of these connections are subtle and unusual. Being highly flexible, the creative person can withdraw effortlessly from the subconscious and making those different connections that can be the basis of humour. Humour also allows a creative person to express feelings that ordinary people would repress.</i></p>
<p><i>(Davis 2004, p. 90)</i></p>	<p><i>A common creative trait is having a good sense of humour. A famous quote is that "the creative adult is a perpetual child, the fact that most growing up, is the tragedy."</i></p>

6.5.15. Tolerance of ambiguity

Operational definition:

‘Being unafraid of the unknown and being comfortable with not knowing where an idea might lead to.’

Table 38. Tolerance of ambiguity, as discussed by various authors

<i>(Davis 2004, p. 27)</i>	Deliberate ambiguity can encourage imaginative answers. Anytime someone is engaged in creative problem solving, there is always a period of ambiguity. Being tolerant for or liking ambiguity is an indispensable creative trait.
<i>(Dacey, 1989, p. 6)</i>	Tolerant people can empathize with ideas that diverge away from their own. Hence they can combine their ideas with new ideas.
<i>(Cross, 2011)</i>	Ambiguity is essential in the design process. It allows participants to have the freedom to manoeuvre independently inside object worlds. It also provides room for changing of meaning when negotiating with others.
<i>(Starko, 2014, p. 115)</i>	Creative solutions often arise from a challenging period that often involves struggle and persistence, confusion, and moments of insight.
<i>(Sternberg, 2000)</i>	To be creative, being patiently tolerant to ambiguity long enough is required to “get our ideas right.”

6.5.16. Willing to grow

Operational definition:

'Being eager to convert negatives into positives and perceiving obstacles as challenges.'

Table 39. Willing to grow, as discussed by various authors

<i>(R. W. Weisberg, 2006, p. 544)</i>	The creative person must demonstrate a willingness to grow. If they do not, they will become a one-time hit, and they will never produce anything further than the first crowd-defying idea.
<i>(Sternberg, 2000, p. 223)</i>	It is difficult to move on, but if one wants to stay creative throughout their life and not be a June one ideal type of person, they need to be willing to grow, even if there is opposition with internal and external pressures.
<i>(Starko, 2014, p. 111)</i>	Having a willingness to continue when obstacles arise, maintaining their motivation without immediate reward, and staying focused for long periods is vital to successful creative endeavours.

6.6 ‘Inner voice’ – Maturity

Even though Treffinger does not explicitly mention ‘maturity’, he labels this category as ‘listening to one’s “inner voice”’. According to Treffinger’s report (2002, p. 17). This category entails a personal understanding that the learners ought to have. Also, having a vision of where they want to go and possess the commitment to do whatever is needed to achieve their goals. Maturity differs a lot, depending on what it is referred to. An organisation, a start-up ecosystem or a person can all be mature, but it means different things in each case. In this study, the explanation as provided by Treffinger refers to the intellectual maturity of a person. As such, I label this category ‘maturity’.

Table 40. Listening to One's "Inner Voice" – Maturity

<i>Perceive the self as creative</i>	<i>Believing in their creative ability and having the desire and self-confidence to create.</i>
<i>Energetic</i>	<i>Able to show great activity or vitality in the work</i>
<i>Independent of thought</i>	<i>Unafraid to be different or to express alternative points of view</i>
<i>Absorbed in work</i>	<i>Losing sight of time and place when working on a project</i>
<i>Reclusive</i>	<i>Tending to be alone to be productive and sometimes coming across as absent-minded, lost or anti-social.</i>
<i>Self-disciplined</i>	<i>Accepting responsibility for actions and enthusiastically looking for opportunities to apply creativity.</i>
<i>Persistent or perseverant</i>	<i>Carrying on when things are not yet working.</i>
<i>Supporting of gender equality</i>	<i>Tending to have a gender-bias-free attitude.</i>
<i>Hard working</i>	<i>Concentrating intensely on a subject or problem of interest.</i>

6.6.1. Absorbed in work

Operational definition:

'Losing sight of time and place when working on a project'

Table 41. Absorbed in work, as discussed by various authors

<i>(Hanks, 1991, p. 51)</i>	A person who aspires to be creative must commit to the hard facts of life: creative effort is required to produce creative results.
<i>Thomas Edison (1847-1931)</i>	"Genius is one per cent inspiration and ninety-nine per cent perspiration."
<i>Michelangelo (1475-1564)</i>	"If people knew how hard I worked to get my mastery, it would not seem so wonderful after all."
<i>(Davis 2004, p. 88)</i>	Phrases that are used to illustrate the energy and motivation of incredibly creative people are "driving absorption," "passionate interest," "high commitment," "unwilling to give up," and "blazing drive". Creative artists, researchers, businesspeople, writers, engineers, and advertising executives become immersed in their ideas and creations. They are unable to rest until they have completed the work.

6.6.2. Energetic

Operational definition:

'Able to show great activity or vitality in the work'

Table 42. Energetic, as discussed by various authors

<i>(Cramond, 1995, p. 10)</i>	Maybe what differentiates people who use rapid ideation to create versus those who are unproductive is the ability to articulate their energy and ideas in a creative mode.
<i>(G. Davis, 2011, p. 172)</i>	Paul Torrance called high energy "the blazing drive".
<i>(Davis 2004, p. 88)</i>	Creative people usually have a high energy level. They have an enthusiastic zest, and their spontaneity is habitual. Creative people can get stuck in seemingly simple problems, possibly working until very late in the night on a project they are excited about.
<i>(G. Davis, 2011, p. 172)</i>	A significant trait of creatively productive people is the astonishing high energy level. It looks like enthusiasm, passionate interest, an unwillingness to quit and driving absorption.

6.6.3. Independent of thought

Operational definition:

'Unafraid to be different or to express alternative points of view'

Table 43. Independent of thought, as discussed by various authors

<i>(Amabile, 1983)</i>	Being independent is the absence of conformity in thinking and reliance on social approval. Being independent appears consistently in lists with characteristics of creative people, and it is particularly relevant to intrinsic motivation.
<i>(Davis 2004, p. 88)</i>	The creative person dares to differ and stand out. Making changes and challenging traditions, bending a few rules. Creative people tend to have an internal locus of evaluation instead of being affected by external influences and opinions.
<i>(Joy Paul Guilford, 1959, 1987)</i>	The creative person is known to have independent judgement.
<i>(Kneller, 1965, p. 67)</i>	Independent people are the most competent in creative achievement because they balance group-centeredness and self-centeredness. Unlike conformists, they have original ideas and are open to the experience. Unlike counter conformists, they are unconventional during creativity, and they adapt to others' ideas, not losing touch with what the group thinks.
<i>(G. J. W. Smith & Faldt, 1999)</i>	Unwilling to rely on other people's opinions are regarded as a description of a highly creative person.
<i>(Starko, 2014, p. 106)</i>	<i>"Individuals exhibiting independence in judgment can assess situations and products by their standards. They do not feel compelled to seek approval from others or follow the latest trends."</i>
<i>(E. Paul Torrance, 1962, p. 14)</i>	Being independent is a vital characteristic of a creative personality.
<i>(E. Paul Torrance & Safter, 1999, p. 102)</i>	Exceedingly creative people are more independent thinkers than those who are less creative.

6.6.4. Reclusive

Operational definition:

'Tending to be alone to be productive and sometimes coming across as absent-minded, lost or anti-social.'

Table 44. Reclusive, as discussed by various authors

<p><i>(Robinson, 2017, p. 237)</i></p>	<p>Creative insights may take time to develop. Some creative organizations understand that time is a critical resource for innovation and may offer their staff discretionary time to work on their ideas. A well-known example is Google, which offers 20 per cent of the time for discretionary projects to their engineers. During this period, staff can pursue any interest they may like. If they have an idea that could be of interest to the company, they can pitch it to their seniors. Since 2005, 5 per cent of all Google products were developed in this 20 per cent discretionary allocated time.</p>
<p><i>(Chemi, 2018, p. 163)</i></p>	<p>Even though it looks like a lesson in hardship, it is at the core of bridging theory and practice. Time alone is the opportunity of not understanding in a safe spot. Frustrations can become creative work; not creative people are geniuses, or they have divine inspiration, but they have a constant dialogue with the artwork. When the pupil finds themselves alone and feels like a continuous period, the artwork's tangible presence is left.</p>
<p><i>(Davis, 2004, p. 91)</i></p>	<p>Creative adults habitually prefer to work and think alone, reflecting their creative independence.</p>

6.6.5. Persistent or perseverant

Operational definition:

‘Carrying on when things are not yet working.’

Table 45. Persistent or perseverant, as discussed by various authors

<i>(Davis 2004, p. 88)</i>	Due to their innovativeness and independence, creative people expose themselves to failure, and criticism, embarrassment, and the apparent possibility of looking like idiots, all the above.
<i>(Kneller, 1965, p. 64)</i>	Creativity demands persistence, as it must be sustained over long periods, possibly facing daunting obstacles. Lying on a scaffold, Michelangelo took seven years to complete the Sistine Chapel.
<i>(Starko, 2014, p. 113)</i>	Creative individuals nearly always persist and struggle on tasks selected by them and not on tasks assigned by others.

6.6.6. Supporting of gender equality

Operational definition:

‘Tending to have a gender-bias-free attitude.’

Table 46. Supporting of gender equality, as discussed by various authors

<i>(Kim, 2016)</i>	Having a gender-bias-free attitude means that stereotypes based on gender are rejected. This attitude develops by viewing strengths from separate genders. It opens the door to intellectual defiance across ethnic, financial, physical, and professional biases. However, gender-bias-free individuals might appear “gender-free” to some.
<i>(Maslow, 1976, p. 88)</i>	(Self-actualised) creative people are spontaneous and effortless, with innocence and are free from stereotypes and clichés.
<i>(Walker, 1986)</i>	Cultural is discouraging females from joining advanced courses, which lead to opportunities for creative productivity. Intentional steps to fix this unacceptable situation could result in females fully participating in educational opportunities that open the doors to a wide range of professions traditionally dominated by males. Cultural biases against women, particularly in science and maths, have caused a massive waste of talent.

6.6.7. Perceive the self as creative

Operational definition:

'Believing in their creative ability and having the desire and self-confidence to create.'

Table 47. Perceive the self as creative, as discussed by various authors

<i>(Stein, 1974, p. 302)</i>	'the significant synthesis is the creative process itself.'
<i>(Karwowski et al., 2019, p. 399)</i>	Create people to believe in their creative strengths and limitations. They believe in one's creative abilities.
<i>(G. Davis, 2011)</i>	Many highly creative people see themselves as creative. They have the habit of creatively doing things, and they enjoy being creative. Having creativity consciousness is a vital and typical trait among creatives. To improve creativity and teach creativity to others, creativity consciousness is the first trait to develop.

6.6.8. Self-disciplined

Operational definition:

‘Accepting responsibility for actions and enthusiastically looking for opportunities to apply creativity.’

Table 48. Self-disciplined, as discussed by various authors

<i>(Kneller, 1965, p. 68)</i>	<i>The creative person possesses and has a sense of mission, even of destiny. Having faith in one's destiny certainly does not guarantee the existence of creative powers. Being a megalomaniac is a psychotic delusion. It is also true that creative people can be depressed.</i>
<i>(Roe, 1976, p. 173)</i>	<i>An extremely creative person can allow himself or herself to indulge in primitive modes of thinking of the primary process and return effortlessly to rational thought. People who can do this can come up with many original ideas. They may not be very interested in the disciplined and critical procedures needed for the logical development or evaluation of their ideas. Creative people can be "idea men," leaving every so often the slow and laborious procedures of confirming the ideas to others.</i>
<i>(G. Davis, 2011)</i>	<i>Being thorough and being high risk-taker and energetic is not enough. Determined creative people ought to finish their projects, preferably in an organized manner.</i>

6.6.9. Hard working

Operational definition:

‘Concentrating intensely on a subject or problem of interest.’

Table 49. Hard working, as discussed by various authors

<i>(R. W. Weisberg, 2006, p. 145)</i>	Biographical material and psychological studies of creative people indicate that creative talents are committed to their work.
<i>(E. Paul Torrance & Safter, 1999, p. 51)</i>	Only those who are committed and have creative motivation can deliver a high level of creative achievement.

7. Research Design

This chapter explains the research design of this dissertation and the steps taken to answer the research questions. Three studies were conducted separately and sequentially, each answering one research question. Table 50 on page 127 is an overview of each study that corresponds to the relevant research question. Figure 12 on page 128 shows the inter-relationship of the research questions. The following pages explain in further detail each study.

The research paradigm in this thesis is constructivism. The premise of this paradigm is that individuals develop and create their subjective meaning of the world based on their personal experiences. Humans have a dual role: perceivers and interpreters, and they construct their version of reality (Jonassen, 1991). Costantino (2008) explains that constructivism indicates a closer emphasis on understanding (*Verstehen*) rather than explaining phenomena (*Erklärung*). There are solid reasons for selecting constructivism in this thesis (constructivism is explained earlier in section **Error! Reference source not found. Error! Bookmark not defined.**). In design schools, educators facilitate workshops and create learning experiences allowing learners to evolve into designers by constructing their knowledge individually. Design education relies on a constructivist learning approach, which has the same foundations as the research paradigm chosen in this thesis. It means the research paradigm of constructivism is highly compatible with design education research.

The researchers' role in this study has been external, not filling in or submitting any responses to the surveys or using personal opinions and expertise. The research was involved with an administrative role, conducting and administering surveys and interviews while remaining independent and distant deliberately, avoiding interfering with the data during the collection process.

Table 50. Research questions and studies

<i>Study</i>	<i>Research question</i>	<i>Method</i>	<i>Participants</i>	<i>Information needed to conduct the study</i>	<i>How does the study answer the research question?</i>
1	What personality traits design educators consider important for the ability to generate ideas?	Survey	Design educators (n=104)	List of personality traits that affect the ability to generate ideas.	Educators choosing the traits they consider as necessary produced a ranking that reflects their perceptions.
2	What teaching strategies design educators use to nurture the design students' ability to generate ideas?	Semi-structured interviews	Design educators (n=24)	Set of questions allowing educators to elaborate on the ways personality traits (from the previous study) are being fostered.	Through interviews, educators explained their pedagogical approaches regarding the traits (from the previous study). These pedagogical approaches constitute teaching strategies.
3	What teaching strategies are favourable for developing the personality traits that nurture the ability to generate ideas?	Survey	Design educators (n=167)	List of teaching strategies and personality traits that are impactful on the growth of the ability to generate ideas	Educators chose the most important traits that they believe are being developed through the teaching strategies that were identified in the previous study.

For the interviews that were conducted for the second research question, several interviewees were approached on LinkedIn with a request for an interview. Initially, more than fifty participants had accepted the request. However, many had to cancel as the Covid-19 pandemic started unfolding, bringing the final number of interviews that were conducted successfully to twenty-four.

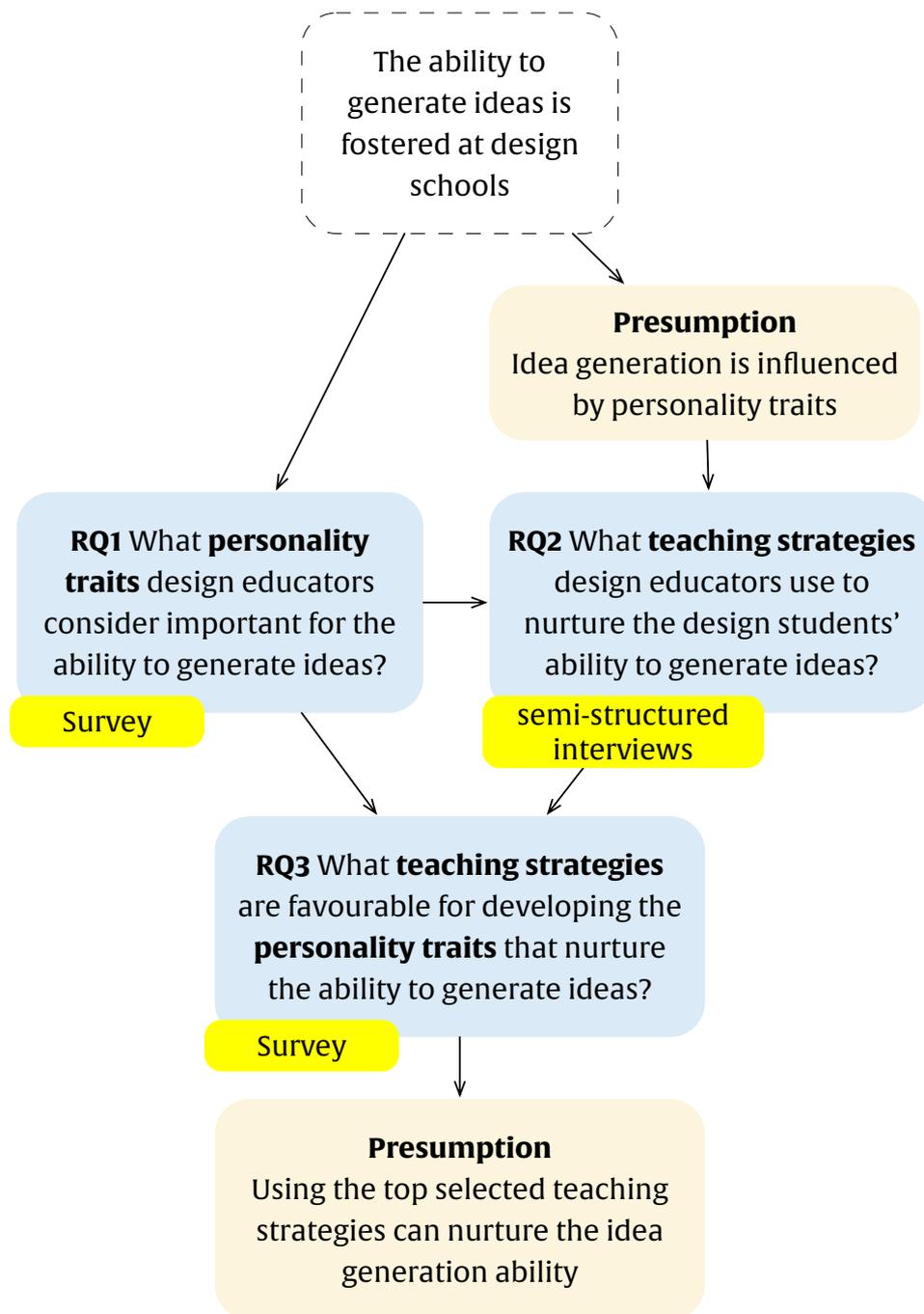


Figure 12. Research question inter-relationships

7.1 Methods

Data were collected through three separate studies. The collection methods have been (by sequence): the first study was a survey (n=104) (quantitative approach), the second study was doing semi-structured interviews (n=24) (qualitative approach), and finally, the third study was a survey (n=166) (quantitative approach). These studies have been sequential, meaning another study followed up the results of each study. This research structure is called Explanatory-Sequential Approach, which is a mixed method. It is an appropriate approach when each study has an equal focus/weight (Edmonds & Kennedy, 2017, p. 196).

These three studies are organised in a participant-selection design. The first study is conducted with a quantitative method to generate a sample (list of preferred personality traits). The second study that followed used a qualitative data collection approach (semi-structured interviews). The second study identified several teaching strategies educators use to promote the students' ability to generate ideas. Finally, the third study was a survey asking educators to map teaching strategies with personality traits.

The 1st study was a survey, The 2nd study was a series of semi-structured interviews, and the 3rd study was another survey.

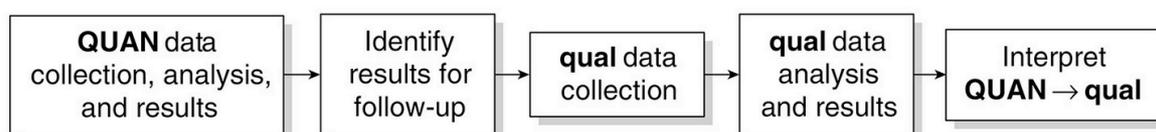


Figure 13. Explanatory-Sequential Approach (Edmonds & Kennedy, 2017, p. 196).

Mixed methods allow researchers to provide equal priority to both (qualitative and quantitative) data sets (Molina-Azorin, 2016). By following a ‘multilevel research triangulation design’, the findings from each level can be utilised and merged into one overall interpretation (Creswell & Clark, 2007, p. 64). *Figure 14 (shown below)* is adapted from Creswell and shows how each level – of study contributed to the next level within this PhD dissertation. Mixed methods is a purposeful combination of two approaches, assuming each paradigm's methodological advantages (Saldaña, 2011, p. 10).

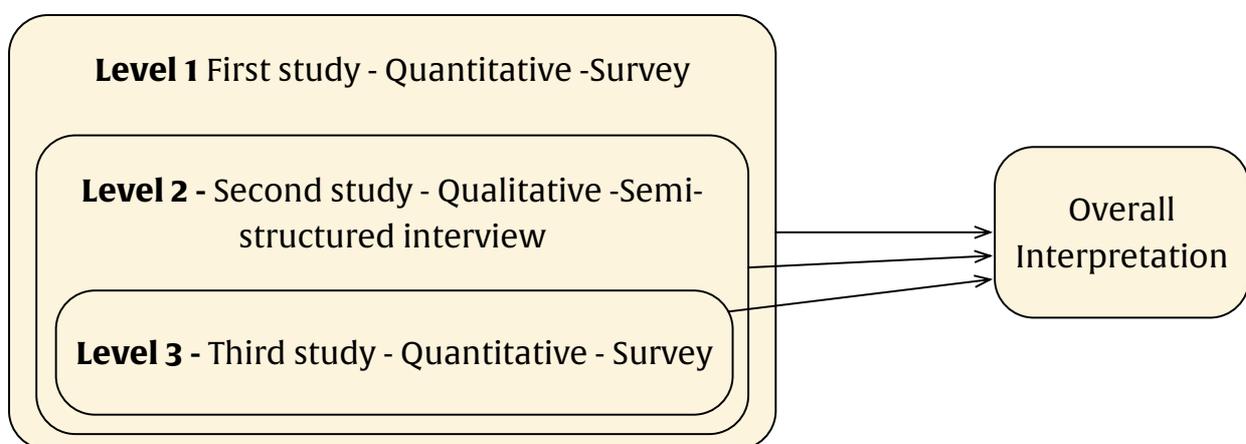


Figure 14. Multilevel research triangulation design

Figure 15 on page 131 shows a methodological diagram. While qualitative studies tend to look at pure numerical figures, the first study (survey) aimed at establishing a ‘cut-off’ line and helped to reduce an extensive list of thirty-six personality traits to sixteen traits. Educators were asked to choose which traits they regarded as crucial for idea generation. The sixteen most favourable traits were used in the second and third studies. The second study was conducted through a series of semi-structured interviews. The interviewees were also provided with the sixteen personality traits (from the first study) among guiding questions. These traits guided the interviewees to unveil what teaching strategies they deploy in their classes without being asked directly, reducing bias (by not resorting to simply stating standard practices) and enhancing originality by sharing spontaneous responses. It resulted in gaining rich data, which upon scrutiny, sixteen teaching strategies were identified.

The third study was a survey that used the fifteen most favourable personality traits (one trait was eliminated for reasons explained in *section 7.4 on page 148*) and the seven most mentioned teaching strategies. Participants were asked to choose the traits they believed each teaching strategy develops.

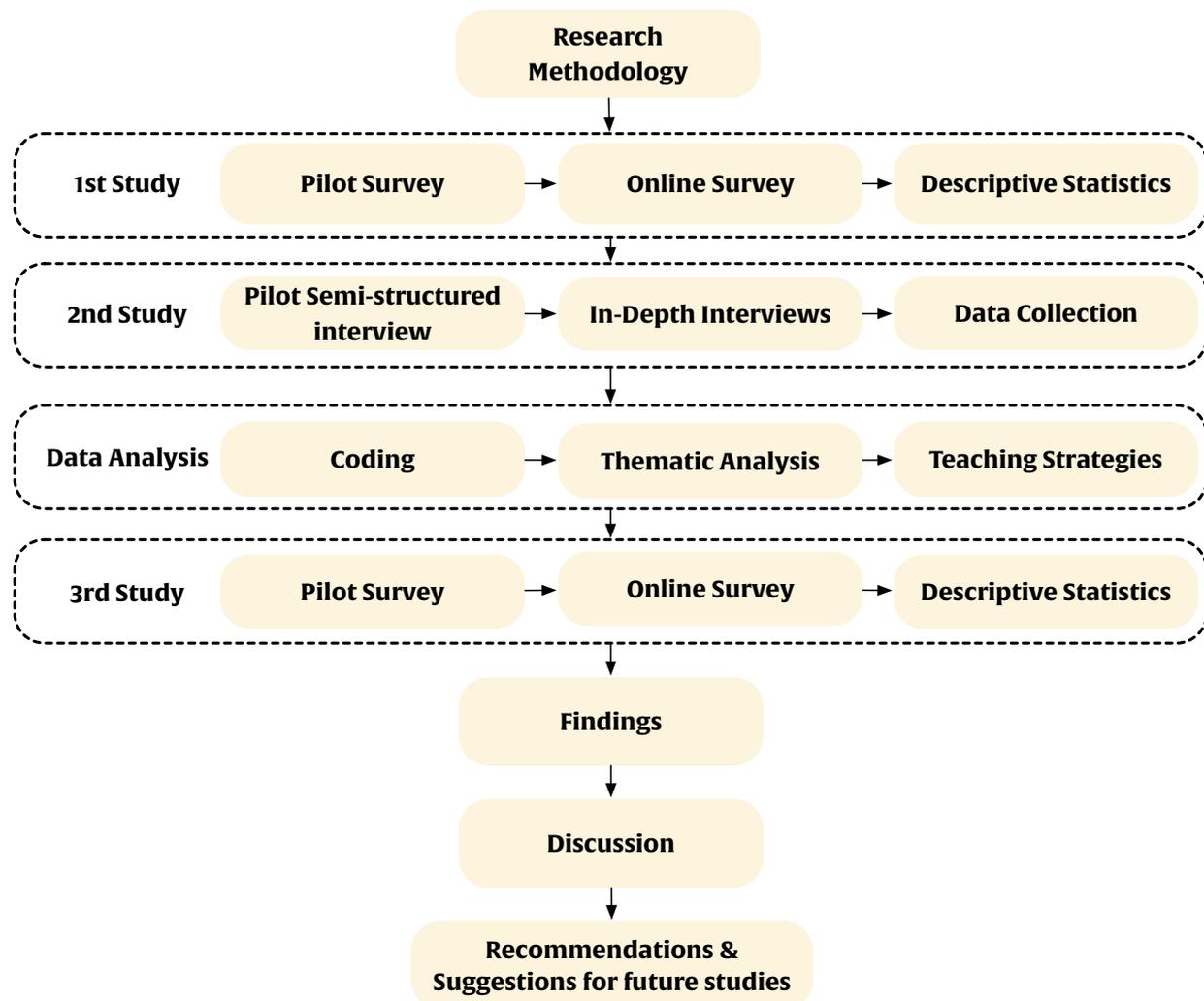


Figure 15. Mixed methods methodology

7.2 Study 1 - Survey

The 1st study identified the following thirty-six factors (personality traits) from the literature:

1. Able to see relationships
2. Able to synthesise
3. Absorbed in work
4. Adaptive
5. Aesthetic sensitivity
6. Analytical
7. Elaborative
8. Energetic
9. Flexible
10. Fluent
11. Hard-working
12. Highly curious
13. Humorous
14. Imaginative
15. Independent of thought
16. Integrative of dichotomies
17. Intolerant of ambiguity
18. Intuitive
19. Metaphoric thinker
20. Open to emotions
21. Open to experience and ideas
22. Original
23. Perceive the self as creative
24. Persistent or perseverant
25. Playful
26. Preferring complexity
27. Questioning authority
28. Reclusive
29. Reorganising or redefining
30. Risk-taking
31. Self-disciplined
32. Sensitive to problems
33. Supportive of gender equality
34. Uninhibited in expressing an opinion
35. Willing to grow
36. Tolerant of ambiguity

This list was converted into a survey. Each term was also rephrased to resemble a colloquial expression as design instructors are not academics who study creativity. They may not be very familiar with wording/phraseology from academia, as these terms come from mostly psychology academics and scholars. Design instructors are not likely to read such material, as many may be design practitioners with hands-on experience in the industry. The sheer volume of a list of thirty-six factors was rephrased to make it appear, on the one hand, less academic and, on the other, more colloquial and more relatable.

Nonetheless, none of these terms was changed in their meaning. The exact wording for each term is provided in *Table 52 on page 136*. Please note that the original terms as defined by Treffinger were used in the first study. These terms were later simplified and improved for clarity. The colloquial and academic terminology matching was checked and verified in two separate sessions by two colleagues knowledgeable in design education and creativity. Not every trait is required to be renamed. Some traits remained unchanged, and some were simply changed in their syntax. For instance, risk-taking was not changed, and playfulness was expressed as playful.

A pilot survey was conducted with five design instructors. The two colleagues who helped verify the colloquial phrases were excluded from the pilot survey. It deemed better to bring in people who were unfamiliar with the study and saw these terms for the first time. The first iteration of the survey included a description of each of these factors. The responders said it was too wordy, resulting in overwhelming participants, and they thought of dropping out. They also mentioned that the descriptions were unnecessary as all these terms did sound familiar. No term was unknown or unexpected, and each term is self-explanatory. Their only concern was that it was plenty of material to read, and as such, it took a long time to complete. There were two questions, only one of which was mandatory. One mandatory question asked participants to select the five most important factors (in colloquial format) to influence the ability to generate ideas. An optional question asked about years of teaching experience.

7.2.1. Sample / Participants

The population sample comes from the staff directories of the world's leading design schools, as specified by the QS World University Rankings 2019, Arts and Design section²⁶. The complete list has two hundred institutions; however, only the top forty universities were considered for this study's practical reasons, as forty are already many institutions to begin with. Some further selection criteria have led to some exclusions, reducing the final number (to fifteen institutions).

The criteria for the population sample for this study were the following:

1. To be teaching design at a bachelor's level in the English language. Top design schools like the Milan Polytechnic or Tongji University were excluded. This requirement does not mean only English-speaking countries were included. For example, Aalto University, a prestigious institution in Finland, a country where English is a second language, offers a bachelor's in design, taught entirely in English. Therefore Aalto University was included.
2. To have design programs. This QS World University Rankings list is titled 'Art and Design,' which includes art schools. This dissertation focuses on design education, Institutions without a design program for excluded. For example, the very reputable Oxford University was excluded as it does not have any design program.
3. Finally, an online staff directory shows their instructors' email addresses publicly accessible without logging to an intranet or requesting contact information.

Over one thousand addresses were painstakingly collected. All non-educational staff was removed, such as exchange study coordinators or admission officers. One hundred four valid responses were collected upon emailing over one thousand instructors. No data was collected regarding each responder's

²⁶ 'Art & Design'. *Top Universities*, <https://www.topuniversities.com/university-rankings/university-subject-rankings/2019/art-design>. Accessed pm 24 December 2020

institution, so it is impossible to produce a breakdown of university or country responses. The responders have had 14.3 years of experience on average, indicating that the population sample is presumably well-experienced as they have been teaching design for many years.

Finally, fifteen institutions were identified (shown in *Table 51 below*). From these fifteen institutions, more than 1,000 email addresses were collected. These institutions are in five countries, with the highest concentration in the United States and the United Kingdom. These two countries would represent two-thirds of the countries if the population sample were fifteen institutions and not individual instructors.

Table 51. First study population sample - selected Institutions

<i>Aalto University</i>	<i>Finland</i>
<i>California College of the Arts</i>	<i>United States</i>
<i>California Institute of the Arts</i>	<i>United States</i>
<i>The Glasgow School of Art</i>	<i>United Kingdom</i>
<i>Loughborough University</i>	<i>United Kingdom</i>
<i>Nanyang Technological University, Singapore (NTU)</i>	<i>Singapore</i>
<i>National University of Singapore (NUS)</i>	<i>Singapore</i>
<i>Parsons School of Design at The New School</i>	<i>United States</i>
<i>Pratt Institute</i>	<i>United States</i>
<i>Rhode Island School of Design (RISD)</i>	<i>United States</i>
<i>Royal College of Art</i>	<i>United Kingdom</i>
<i>School of Visual Arts (SVA)</i>	<i>United States</i>
<i>The University of Melbourne</i>	<i>Australia</i>
<i>University of Technology Sydney</i>	<i>Australia</i>
<i>University of the Arts London</i>	<i>United Kingdom</i>

Table 52. Colloquial & academic terminology (used in the first study)

<i>Colloquial Phrase</i>	<i>Academic terminology</i>
Making connections between seemingly unrelated ideas	Seeing relationships
Adaptive	Adaptability; Making do with what at hand to reach goals
Aesthetic sensibility	Aesthetic sensitivity and/or interests
Has analytical skills	Analysing
Consider himself or herself as creative	Awareness of creativeness: Sees himself or herself as creative
Imaginative	Capacity for fantasy or imagination
Desire to resolve ambiguity & disorder	Desiring to resolve ambiguity or bringing order to disorder
Able to elaborate on ideas	Elaboration
Energetic	Energetic (or hyperactive-overactive physically or mentally)
Able to change one's point of view	Flexibility
Produce many ideas	Fluency
Naturally curious	High levels of curiosity
Able to think independently	Independence of thought
Accommodate opposites	Integration of dichotomies
Able to concentrate and be absorbed into the work	Intense concentration and absorption in work
Works intuitively	Intuition
Uses comparisons or analogies make new connections	Metaphorical thinking
Needs alone time	Need for alone time: Interest in reflective thinking:
Work on their own to finish a project	Need for and-or demonstration of autonomy, self-directed or self-disciplined
Emotionally sensitive	Open to feelings and emotions: Shows emotional sensitivity
Not afraid of the unknown	Openness to experience and ideas, not afraid of the unknown
Produces original ideas	Originality
Determined	Persistence or perseverance
Playful	Playfulness
Enjoys complexity	Preferring complexity or understanding complexity
Being aware of existing problems	Problem sensitivity
Rejects stereotypes	Rejects sex stereotyping, free from other stereotypes
Likes re-organising	Reorganizing or redefining
Risk-taking	Risk-taking
Sense of humour	Sense of humour and/or facility for producing humour
Combining thoughts to constitute new patterns or structures	Synthesizing
Outspoken & spontaneous	Tenacity and lack of inhibition (often spontaneous) in expressing of opinion
Tolerant of ambiguity	Tolerance for ambiguity
Critical of authority	Unwillingness to accept authoritarian assertions throughout a critical examination
Willing to work hard	Willing to work hard: Liking and capacity for thinking and work
Willing to grow	Willingness to grow

7.2.2. Data Collection Method

The responses were collected in about four weeks, around October-November 2019, using Google Forms. Google forms were selected because of its reasonably clean, uncluttered interface. It also has good support of a mobile interface with a responsive website, making it easy for participants to submit their responses from their phones. One measure to improve validity is that every time a participant would open the survey, the list of personality traits was randomised. No reward was given for submitting a response, as rewarding participants are discouraged by the Hong Kong Polytechnic University.

The study resulted in figures that provide a ranking of personality traits. This ranking indicates the perceptions of design educators on which traits are the most important (and perhaps the most impactful) in fostering idea generation. The results are being displayed in the findings chapter, section 8.1 on page 161.

*Table 53. Study 1 population:
Locations of the selected Institutions*

<i>United States</i>	<i>6</i>
<i>United Kingdom</i>	<i>4</i>
<i>Australia</i>	<i>2</i>
<i>Singapore</i>	<i>2</i>
<i>Finland</i>	<i>1</i>

7.2.3. Data Analysis and Synthesis

This study aimed to determine a list of personality traits from most favourable to least favourable. Therefore it is regarded as a quantitative study. Despite this study's quantitative nature, the aim has to discover trends and not collect very precise numerals. David Hannah and Brenda Lautsch (2011) describe this type of utilising counting in research as corroborative counting. This approach's logic triangulates two processes: qualitative analysis (utilising thirty-six traits from literature) and quantitative analysis (obtaining 'votes' on the most favourable traits).

The final outcome is an ordered list that trait favourability can be considered a qualitative result. The responders had to choose from a list with multiple personality traits, the survey variables were categorical. The intention has been to gather design instructors' opinions which can help to reduce the number of personality traits from thirty-six to at least half. The second study used the reduced list (with sixteen traits). The data collected through Google Forms was imported to Excel, and the ranking was percentage-based and populated with the =COUNTA function.

Various measures were taken to increase validity and reliability. These include running a pilot test to determine any flaws and errors. Even though a Likert scale was considered first, it was decided not to use it as evaluating thirty-six factors would take an enormous amount of time, resulting in reduced interest in the survey and higher responders exiting without submitting responses. Instead, choosing only the five most essential traits is deemed a more precise measurement level. Also, all the personality traits were set to randomise each time the link to the survey was loaded.

7.3 Study 2 – Semi-structured interviews

A study with semi-structured interviews was planned and conducted. This study was reviewed and approved by the Human Subjects Ethics Subcommittee (HSESC) of the Hong Kong Polytechnic University. Participants could exit the interview without any penalty and agreed to participate voluntarily and without any compensation. A document was provided explaining these terms, which can be viewed [*on page 308*](#).

7.3.1. Sample / Participants

The interview subjects were selected with two methods. One method was reaching out to people through LinkedIn, and the other method was snowballing through word of mouth. The selection criteria for interviewing participants were the following:

- To be teaching design in English. Being a native English speaker was not a requirement
- To voluntarily accept the invitation without any compensation, and
- To have a genuine interest in talking about design education.

Contacts with a personal relationship with (such as former classmates who became educators or people who taught the researcher previously) were excluded, as these contacts would tend to do two things that could impact the study negatively:

a) potentially giving feedback that is not related or relevant to the interview schedule or side-tracking to other discussions. Moreover secondly,

b) build their responses upon former joint experiences between them and the participant. These two reasons can introduce bias in the collected data.

Therefore, personal contacts were avoided. To prevent that from happening, interviewing personal contacts was avoided. In total, twenty-four successful interviews were conducted, excluding two pilot interviews.

The Covid-19 pandemic has caused issues in administering this study, resulting in troublesome logistics for the researcher and many interview subjects. Nearly half of the people who had agreed to do the interview had to cancel, and many of those who did commit had to reschedule multiple times due to unforeseen circumstances. Eventually, even some locally-based Hong Kong interview subjects had to cancel. Subsequently, all interviews were conducted by teleconferencing means. A variety of software was used, including (but not limited to) Skype, Google Hangouts, Zoom, Teams and even regular phone calls. To anonymise the participants, only the audio was recorded. In some software-only video recording was possible, the audio was extracted immediately after the interview, and the video data was discarded. The audio files were transcribed, and all the audio files were deleted as soon as each interview was converted to a textual format.

The interviewees taught a wide range of design subjects, making the data set fairly diverse among design educators. *Table 54 below* showcases the range of these subjects. The column frequency indicates how many individuals have been teaching a given. It should also be noted that many participants teach multiple subjects. For example, the same participant may have been teaching graphic design, business design and entrepreneurship, which means participants are not confined to single subjects.

*Table 54. Subjects taught by the interview sample**

<i>Frequency</i>	<i>Subject</i>
11	Graphic Design
4	UX Design
3	Fashion Design, Industrial Design, Product Design
2	Advertising Design, Basic Design, Branding Design, Design Research, Exhibition Design, Interior Design, Media Design, Typography
1	Art & Media, Business Design, Design History, Design Processes, Design Science, Design Theory, Editorial Design, Entrepreneurship, Ergonomics, Experimental Design, Design Methods, Prototyping, Social Design, Sustainability, Visual design
	*Some interviewees taught multiple subjects

Table 55 below shows where the interviewees were located when the interview was conducted. While the location can often be an indicator of nationality, it does not mean that interviewed people's nationality matches the listed countries. *Table 56 below* and *Figure 16 on page 142* demonstrate the participants' years of teaching experience.

Table 55. Locations of the interview sample

<i>Frequency</i>	<i>Subject</i>
4	USA
2	Sweden, the Netherlands, Hong Kong
1	Canada, China, Germany, Japan, Philippines, Russia, Singapore, South Korea, Spain, United Arab Emirates, United Kingdom

Table 56. Years of experience by the interview sample

<i>Frequency</i>	<i>Years with teaching experience</i>
4	6 years
3	16 years, 10 years
	45 years, 23 years, 20 years, 19 years, 13 years, 11 years, 9 years, 7 years, 4 years, 3 years
1	
<i>Median</i>	10 years
<i>Average</i>	12.8 years

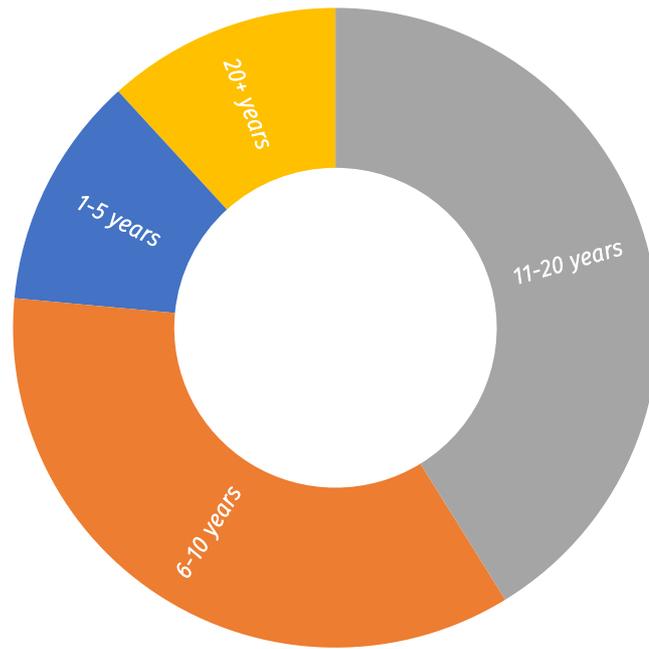


Figure 16. Years of experience of the interviewees

7.3.2. Data Collection Method

An interview schedule was planned, but the participants had not seen it, and they were asked these questions orally at the time of the interview, yielding spontaneous, authentic responses. Another document was provided in advance, asking them to choose which five personality traits they consider impactful to idea generation (on page 307). This document was given together with an information sheet (on page 308) and a consent form (on page 309).

The interview schedule was followed verbally. However, the interviewees did not see the questions as the intention was to create a relaxed atmosphere where people could voice their opinions and talk freely, professionally and respectfully. The questions were asked in an informal setting without pressure, encouraging the interviewees to respond for as long or short as they preferred. They were also informed that the interview was being recorded and that they could quit at any time. The interview schedule can be seen in Table 57 on page 144.

Even though the objective was to identify teaching strategies, this interview schedule deliberately avoids mentioning any teaching strategies. Educators (like many other professions) presumably tend to place things in boxes or mention the standard strategy if they are explicitly being asked. While there is nothing inherently wrong, it lacks depth and restricts the participants from letting their strategies through their narrative.

It was preferred to ask relevant but still open questions and create a platform where the interviewees would elaborate on their practice in the design classroom, unveiling the teaching strategies and the pedagogical methods they use to teach or get their students to generate ideas.

Table 57. Interview agenda

Interview section	#	The question to be explored	Notes	
Warming up	1	How long have you been teaching design?	Demo-graphics	
	2	What subjects do you teach?		
	3	What is your background?		
	4	Do you teach beginning students, almost graduates, or both?		
Teaching Strategies	5	Tell me about your experience with teaching design students. Do you foster their creativity in your classes?		
	6	What do you think about the student ability to generate ideas? Should we teach it? Does it happen by itself? Is it important?		
	7	How do you think students learn how to generate ideas? What happens / Where it happens?		
Exploration of factors	8	Which five factors (from the list) do you think are the most crucial to develop idea generation skills?	List of factors to be given separately in advance	
		Adaptive		Adaptive
		Aesthetic sensibility		Aesthetic sensitivity
		Imaginative		Imaginative
		Able to change one's point of view		Flexible
		Produce many ideas		Fluent
		Naturally curious		Highly curious
		Able to think independently		Independent of thought
		Accommodate opposites (introvert / extrovert, selfish/unselfish and so on)		Integrative of dichotomies
		Uses comparisons or analogies make new connections		Metaphoric thinker
		Playful		Playful
		Being aware of existing problems		Sensitive to problems
		Risk-taking		Risk-taking
		Making connections between seemingly unrelated ideas		Able to see relationships
Combining thoughts to constitute new patterns or structures	Able to synthesise			
Tolerant of ambiguity	Tolerant of ambiguity			
Willing to work hard	Hard-working			
9	Is there any factor that you struggled selecting, but finally you did not select?			
Exploration of issues	10	Regarding fostering idea generation, are you aware of any problems or issues?		
Finish	11	Is there anything you would like from me? Can I help you with anything?		

7.3.3. Data Analysis and Synthesis

The data sets were transcribed using Otter.ai, an online software that automatically converted the audio recordings from the interviews into a textual format. The automatically transcribed text was previewed and corrected accordingly by the researcher. While there was no personal risk of the participants getting identified by a third person to eliminate (or further reduce) the chances of data leakage from this software, once all transcriptions were completed and the participants were anonymised, the Otter.ai account was deleted as well as all account data.

All interviews were administered and conducted by the researcher. All transcriptions were previewed and double-checked by the researcher, providing a very high degree of anonymity to the participants. Finally, twenty-four interviews amounted to recording content that was over twenty-six hours. This data set accounted for 172,832 words, including irrelevant information about conducting the interviews, such as introductions, filler words, explanations of the interview protocol to participants and more. It also includes all the labels that indicate dialogue, such as “Person 10”.

This text was then brought in qualitative analysis software. There were three rounds of coding, of which the first two rounds were done in the software, and the third round was conducted only partially with software. The first round of coding generated more than 150 codes. The main objective was to familiarise the data set and internalise what was being said overall, as a single body of interviews and not individual interviews that reflect distinct individuals. It was done without paying too much attention to discovering patterns or identifying themes; instead, it was primarily unfocused, without any deliberate effort to detect the teaching strategies.

The second round of coding emphasised reducing the number of codes and narrowing them down as much as possible. The process attempted to identify potential teaching strategies that (the interviewee used or believed) improve the ability to generate ideas. The strategies were, most of the time, explained indirectly through narrative. After a set of teaching strategies was populated, the third coding round was conducted without relying on coding software. Instead, reading the text thoroughly and verifying that the teaching strategies (identified earlier, in the coding phase two) were indeed mentioned one way or another and elaborated further.

The identified teaching strategies are relatively mundane or perhaps standard in design education. There was nothing obscure or unexpected about them, and that is perfectly fine, considering that design schools have -more or less- standard ways to teach design. To effectively communicate the strategies for study 3, the labels found in *Table 61 on page 166* were suggested.

These labels are suggestions based on the context. It might be possible that another label could have also worked well. Nonetheless, it was decided to keep the labels in plain English and refrain from any language that may sound difficult, too academic, or incomprehensible. For example, 'critical conversations' initially was labelled as 'Socratic method', which is about the same concept as critical conversations; however, the Socratic method is not as explicit as critical conversations since not everyone is familiar with the Socratic method. Not disregarding its importance, the exact word labelling is not as important as the teaching strategies communicated through those labels. This study resulted in a list of teaching strategies that educators use (or have used) in their classes to facilitate idea generation. You can read about these teaching strategies in the findings chapter, in section *8.2 on page 164*.

The method used to identify, analyse, and report the data was thematic analysis by following the guidelines set by Virginia Braun and Victoria Clarke (2006). According to the authors, thematic analysis can be a flexible, constructionist method that explores how realities, meanings and experiences are the consequences of the various discourses operating within society (Braun & Clarke, 2006). This method aims not to generalise but rather to capture detailed descriptions that help understand the complexity and how it is applied in the context studied (Bloomberg, 2019, p. 110). Braun and Clarke (2006) offer a detailed account with six steps to be followed. This process is briefly explained in *Table 88 on page 332.*

7.4 Study 3- Survey

This study is a survey that combines findings from study 1 and study 2. There have been two major components of this survey:

- a) the most fifteen favourable traits (ranked the highest) among the original total of thirty-six factors. The selection of those fifteen traits was determined from study 1 results. See section 8.1 on page 161.
- b) The seven most favourable teaching strategies were identified through semi-structured interviews conducted in the second study. This study yielded an in-depth data set upon analysis that produced a list of teaching strategies.

The basic premise of study 3 is to map teaching strategies with the fifteen most favourable traits. For each strategy separately, participants were asked which of the following personality traits they believe this strategy was developing.

It is worth noting that while the second study used the sixteen most favourable traits, the third study used the fifteen most favourable traits. It means that the 16th trait, TOLERANCE OF AMBIGUITY, was removed for various reasons. These reasons are (in no particular order)

- In the interviews, it was the least selected or discussed option.
- From the list of the most favourable 16 traits, tolerance of ambiguity was last. (16th). Also, it was the only one chosen by less than 30% of the participants.
- The only option that confused some interviewees, who asked for clarifications, was 'tolerance of ambiguity means intolerant of ambiguity or what?'. It means it was the only personality trait that was unclear by itself, without a supporting description.

- Some people from the interviews mentioned that accommodating opposites, making connections between unrelated ideas and independent thinking overlaps with a tolerance of ambiguity.
- Overall, the 3rd study had many options and was already deemed overwhelming, with seven strategies and 15 traits. Participants had $7 \times 15 = 105$ choices. If tolerance of ambiguity were included, it would have been slightly more choices to make, with 120 options in total. As it appeared to be not self-explanatory, it could have confused some participants.

7.4.1. Pilot study for study 3

A pilot study was conducted with five design educators, who were asked to give their honest feedback on improving the survey or pointing out any flaws or mistakes. The following two modifications were made upon receiving their invaluable feedback:

Each person chooses to teach differently, and educators have preferences on teaching strategies. The five responders from the pilot study did not use 100% of the identified strategies. A major flaw in the first version of this survey was to ask educators to evaluate teaching strategies that they were not using in their classes. This significant insight introduced the question: *have you used this teaching strategy? If not, please proceed to the next question.* The introduction of this question allowed participants to offer their perceptions only regarding teaching strategies that they were accustomed to.

These five participants also mentioned that as all these terms sound familiar and have a genuine interest in the topic, they were interested in being informed later about the study results. A question was added at the end: *“would you like to receive a soft copy of this dissertation once it is published? If yes, please submit your email address”.*

I asked these five participants to time their submissions, and everyone did it within 10 minutes, the shortest being 5 minutes. The introductory text requesting potential participants to provide their responses mentioned that the survey should take 5-10 minutes to complete with this information.

7.4.2. Sample / Participants

The population in study 3 is largely identical to the population in survey 1. All participants have been instructors from the world's best design universities, as defined by the QS World University Rankings 2020, Arts and design section²⁷. Study 1 involved collecting over 1,000 email addresses from the list up to the list's 40th institution (Study 1 used QS World University Rankings 2019). As the procedure of collecting email addresses was painstaking and too time-consuming, a different approach was used this time. Collecting emails was done using tools that streamlined and automated the process. Google Chrome was used for browsing, combined with various plugins and online tools to scrape content from websites and export it into plain text. Over 6,500 email addresses were collected, including names and positions within these universities' organisations, making it easy to process and clean the irrelevant email addresses through a spreadsheet.

The top 40 schools were selected, and the first three selection criteria were identical to study 1.

1. To be teaching design at a bachelor's level in the English language
2. To have design programs, meaning removing Art schools that do not have a design program.
3. To have an online staff directory that shows the instructors' email addresses publicly accessible without logging in to an intranet or requesting contact information.
4. One more criterion was introduced in study 3, which was an exception to include two universities in Nordic countries, Denmark and Sweden. This inclusion introduced two other universities that do not have undergraduate programs taught in English (contrary to Aalto university in Finland, an English undergraduate design program). Nonetheless, both Denmark and Sweden are reputable in the design realm. According to the European Union, both countries

²⁷ 'Art & Design 2020'. *Top Universities*, <https://www.topuniversities.com/university-rankings/university-subject-rankings/2020/art-design> Accessed on 24 December 2020

speak English as a second language with a very high percentage rate, 86% (both countries have the same percentage) (European Commission, 2012, p. 21). To diversify the pool of participants, two other schools were included. Eighteen universities were compiled with all the criteria mentioned above (three more compared to study 1). Two Nordic institutions and one more institution from Canada, previously not included in the 2019 list appeared in the 2020 list.

*Table 58. Study 3 Population Sample –
Locations of the selected Institutions*

<i>United States</i>	<i>6</i>
<i>United Kingdom</i>	<i>4</i>
<i>Australia</i>	<i>2</i>
<i>Singapore</i>	<i>2</i>
<i>Canada</i>	<i>1</i>
<i>Denmark</i>	<i>1</i>
<i>Finland</i>	<i>1</i>
<i>Sweden</i>	<i>1</i>

Table 59. Population sample – Institutions selected

<i>Aalto University</i>	<i>Finland</i>
<i>California College of the Arts</i>	<i>United States</i>
<i>California Institute of the Arts</i>	<i>United States</i>
<i>Emily Carr University of Art + Design</i>	<i>Canada</i>
<i>The Glasgow School of Art</i>	<i>United Kingdom</i>
<i>Loughborough University</i>	<i>United Kingdom</i>
<i>Nanyang Technological University, Singapore (NTU)</i>	<i>Singapore</i>
<i>National University of Singapore (NUS)</i>	<i>Singapore</i>
<i>Parsons School of Design at The New School</i>	<i>United States</i>
<i>Pratt Institute</i>	<i>United States</i>
<i>Rhode Island School of Design (RISD)</i>	<i>United States</i>
<i>Royal College of Art</i>	<i>United Kingdom</i>
<i>The Royal Danish Academy of Fine Arts (KADK)</i>	<i>Denmark</i>
<i>School of Visual Arts (SVA)</i>	<i>United States</i>
<i>Umea University</i>	<i>Sweden</i>
<i>The University of Melbourne</i>	<i>Australia</i>
<i>University of Technology Sydney</i>	<i>Australia</i>
<i>University of the Arts London</i>	<i>United Kingdom</i>

7.4.3. Data Analysis and Synthesis

Similarly to Study 1, the data collection has been responses through a survey, producing quantifiable responses measured with numbers which appear as a quantitative approach. Moreover, the interpretation of the results belongs to the qualitative realm. The data was collected through Google Forms and was compiled on a spreadsheet. See *Table 63 on page 201*. This table portrays the relationships between fifteen personality traits and seven teaching strategies. Each of these units (fifteen traits and seven teaching strategies) is displayed separately as a stand-alone piece of data. All this information is provided in the findings chapter, on the RQ 3 Findings *on page 199*.

Descriptive statistics and corroborative counting were used. As explained earlier in the data analysis section of study 1 (*on page 138*), corroborative counting is a research method utilising counting. It triangulates two separate processes: qualitative analysis (utilising fifteen traits from literature and seven teaching strategies derived from semi-structured interviews) and quantitative analysis (asking more than a hundred educators to choose the traits they believed were appropriate).

As the data collected is numeric, yet the study has a qualitative approach, the data's meaning lies in the interpretation and not the exact figures. Points of interest have been very highs and lows. Also, special attention is paid to the median figures of percentages. As medians measure a central tendency that represents the middle point of an ordered list (Harland, 2011, p. 94), it deems to be a suitable indicator of trends towards educators' favourability or preferences. The median figures combined with percentages provide an excellent foundation for a clean dataset examined thoroughly for patterns and similarities and contradictions, inconsistencies, and perhaps any paradoxes.

Careful and deliberate choices were made to improve the validity and reliability of this survey. The study was run through a pilot study test. The test dramatically improved the survey's layout and the quality/wording of the questions. Despite a few calls to introduce open responses (asking participants to insert a personality trait that they were not being offered to choose), no such open response was used. Instead, all responders were given the same options, ensuring the consistency of the measured level. All personality traits were randomised every time the survey was opened. Also, the participants could always see a progress bar displaying how many questions were remaining ahead. It was an effort to indicate their progress and limit the possibility that someone may exit. Every question had fifteen options to choose from, and there were seven teaching strategies to respond to. As the number of options was considered somewhat high, demographic questions were finally not considered. Nonetheless, the pilot study emerged that participants needed less than ten minutes.

7.5 Delimitations

Idea generation involves producing ideas. A subsequent step is selecting which ideas will move forward, which can be done in various ways. It could be that some ideas are considered good, and bad ideas are discarded. Another possibility is that the best idea (by some judgment) is pushed onwards and materialized. In contrast, the remaining ideas are discarded or perhaps saved to be reviewed at a later stage.

The process that involves selecting, evaluating, and deciding which ideas will be continued forward - *idea evaluation*- is not within the scope of this study. Ideation (see section [5.5 on page 33](#)) is regarding two aspects, idea generation and idea evaluation. This study is only focusing on idea generation

Another delimitation worth pointing out is that design is being taught to non-designer disciplines, such as engineers or business majors. This study has not been looking at non-design programs that include design studies in their curriculum. Instead, it is looking explicitly at design programs, where the graduates would become professional designers.

As this dissertation attempts to identify teaching strategies that are believed to improve the ability to generate ideas, it gathered a large amount of survey responses with the aim to draw generalised conclusions and collect rich data from anonymised interviewees. As such distinct location-specific variables aspects such as culture, different education contexts, traditions and norms, as well as years of educational experience by institutions or educators are not within the scope of this study.

Involving students too is something that is not within the scope, even though it was considered at the very beginning of this PhD, but as it was logistically very difficult to access students beyond the Hong Kong Polytechnic University, the focus of the thesis remained on the perception of educators worldwide.

Finally, a deliberate choice was made to exclude postgraduate programs. Based on the assumption that master's students have already been through an education that has fostered their creativity, it is deemed more suitable to consult educators who teach in undergraduate programs.

7.6 Limitations

Like many studies, the present study also encounters various limitations that must be acknowledged. The study is limited by language. English has been the only working language for this study, including the core body of the literature being used. Also, all interviews and surveys were conducted in English.

The global pandemic has affected this study in various ways. Administering the study and conducting interviews has been challenging and many previously agreed participants dropped out.

The top institutions in the QS World Rankings are dominated by institutions based in western countries, which may mean the global community might be unrepresented.

Students are excluded from the research design and the results portray the perceptions of design educators. Whether these perceptions do have an effect or not was examined. Initially, there was a plan to include students, however recruiting a group of students as diverse as the diverse group of educators who responded proved to be logistically challenging.

Recruiting local students from Hong Kong did not seem proper as such a group would have been culturally homogenous, and cultural barriers could evolve into a confounding factor.

Course syllabi were unavailable despite multiple outreach attempts. Such documents could provide a deeper understanding of how courses are planned and whether idea generation or creativity are explicitly considered learning objectives but the efforts to collect them have been unfruitful.

The timing of the study. The current events and circumstances have had an enormous impact on conducting this study, with major incidents in Hong Kong and elsewhere. External events have caused participants to cancel or become unavailable.

In addition to the previous remark, last-minute changes or additional obligations that emerged from the circumstances, more effort and more workload was required to collect sufficient data, caused delays that pushed the thesis's submission further back at the researchers' expense of time and private resources and without assistance.

The lack of previous studies in the same area can also be regarded as a weakness. More studies could help solidify the area and provide more perspective that this dissertation addresses for the first time.

There could be biases that the researcher did not or could not control, meaning there is a possibility that the results could be inappropriately affected (Price & Murnan, 2004). There could also be inherent bias because people are naturally biased, including those who participated in this dissertation's studies. The fact that responders are employed in various institutions in various countries should theoretically have reduced biases.

The findings are solely based on the perception of the design educators who participated which do not necessarily reflect the domain as a whole.

The study did not consider design agencies, professionals, or industry bodies that are neighbouring design. While the main focus has been design education, design is tightly connected to the industry. This study is limited by not including the industry

8. Findings

Research question 1.

*What **personality traits** design educators consider are important for the ability to generate ideas?*

According to the teachers' perceptions, this question attempts to identify which characteristics of a person correlate with the ability to generate ideas, as thought by design educators. A total of one hundred four responders participated in a survey that produced a ranking that showcases which personality traits are considered the most favourable. The relevant section is [8.1 on page 161](#).

Research question 2.

*What **teaching strategies** design educators use to nurture the design students' ability to generate ideas?*

This question attempts to identify the various teaching strategies being used by various design educators. A series of semi-structured interviews with twenty-four participants produced a list with fifteen strategies. Through the interviews, the participants were never asked explicitly what teaching strategies they use. Instead, they were asked open-ended questions that allowed them to elaborate on their teaching experience—eventually describing their favourable teaching strategies through actual, real-world examples deriving from their teaching experience. The relevant section in which the teaching strategies are being explained with quotations from the interviews is section [8.2 on page 164](#).

Research question 3.

*What **teaching strategies** are favourable for developing the **personality traits** that nurture the ability to generate ideas?*

The first research question attempts to identify personality characteristics. The second research question attempts to identify teaching strategies, both deriving from the educators' perceptions. A consequent question is whether the perceived teaching strategies correspond to the perceived personality traits and which strategies would suit specific personality traits. Through a survey, design educators were given teaching strategies and were asked to choose which personality traits they believe each teaching strategy develops. This study's results can be found [on page 199](#).

8.1 Finding 1 (RQ1)

The first research question is phrased as:

*What **personality traits** design educators consider are important for the ability to generate ideas?*

A survey asked participants to select the five most important factors (personality traits) that can influence the ability to generate ideas. There have been a little over than a hundred valid responses (n=104), and a list of the most favourite personality traits can be seen in [*Table 60 on page 163*](#).

This survey results indicate that three traits, HIGHLY CURIOUS, the ABILITY TO MAKE CONNECTIONS BETWEEN UNRELATED IDEAS, and THINKING INDEPENDENTLY are considered very important by more than half of the participants. SYNTHESISING, FLEXIBLE and IMAGINATION were selected by almost half of the participants, making them significant personality traits. It is worth noting that elaborating on ideas, analytical skills, being autonomous, and NOT BEING AFRAID OF THE UNKNOWN were not selected by any of the participants as factors that contribute to the growth of the ability to generate ideas. Perhaps these factors are considered essential for generating ideas. However, they do not help as much to develop the *ability* to generate ideas.

Also, SPENDING TIME ALONE, BEING ALONE, SPONTANEITY, and QUESTIONING THE STATUS QUO are considered personality traits of creative people. However, as the results of this study suggest, they do not help in the growth of generating ideas. Perhaps these are personality traits that come later, once an individual has been through a learning curve and has grown to achieve a higher creative potential status.

Please note that even though the highest figures in this survey (such as 54.81% for HIGHLY CURIOUS) could be considered low, in purely numerical terms.

Nonetheless, figures such as 54.81% are very significant, as the participants could only choose five options out of 36 options. If the number of options was smaller than 36, then it is probable that the survey would have resulted in higher figures in numerical terms.

Nonetheless, about one-third of the given personality traits have been selected by at least 30% of the participants, indicating that this study suggests that these higher-ranking traits are the most significant for the growth of the ability to generate ideas. The population sample (n=104) is not small, considering it is a particular demographic, educators who teach design. There is no global population registry to know precisely how many design educators are in the world. Still, receiving more than 100 responses from a pool of 15 different institutions is a reasonable rate for generalisation.

Table 60. "Select five important factors influencing the ability to generate ideas."

<i>Academic terminology</i>	<i>%</i>
<i>Seeing relationships</i>	<i>54.81</i>
<i>High levels of curiosity</i>	<i>54.81</i>
<i>Independence of thought</i>	<i>53.85</i>
<i>Synthesizing</i>	<i>46.15</i>
<i>Flexibility</i>	<i>46.15</i>
<i>Capacity for fantasy or imagination</i>	<i>46.15</i>
<i>Metaphorical thinking</i>	<i>39.42</i>
<i>Risk-taking</i>	<i>37.5</i>
<i>Fluency</i>	<i>36.54</i>
<i>Adaptability</i>	<i>36.54</i>
<i>Playfulness</i>	<i>36.54</i>
<i>Willing to work hard: Liking and capacity for thinking and work</i>	<i>35.58</i>
<i>Integration of dichotomies</i>	<i>31.73</i>
<i>Aesthetic sensitivity and/or interests</i>	<i>31.73</i>
<i>Problem sensitivity</i>	<i>30.77</i>
<i>Tolerance for ambiguity</i>	<i>28.85</i>
<i>Willingness to grow</i>	<i>25</i>
<i>Originality</i>	<i>23.08</i>
<i>Preferring complexity or understanding complexity</i>	<i>18.27</i>
<i>Sense of humour and/or facility for producing humour</i>	<i>15.38</i>
<i>Persistence or Perseverance</i>	<i>15.38</i>
<i>Intuition</i>	<i>13.46</i>
<i>Rejects sex stereotyping in interests: Free from other stereotypes</i>	<i>13.46</i>
<i>Intense concentration and absorption in work</i>	<i>13.46</i>
<i>Open to feelings and emotions: Shows emotional sensitivity</i>	<i>10.58</i>
<i>Desiring to resolve ambiguity or bringing order to disorder</i>	<i>8.65</i>
<i>Energetic (or hyperactive-overactive physically or mentally)</i>	<i>7.69</i>
<i>Awareness of creativeness: Sees or himself herself as creative:</i>	<i>4.81</i>
<i>Unwillingness to accept authoritarian assertions throughout a critical examination</i>	<i>4.81</i>
<i>Tenacity and lack of inhibition (often spontaneous) in expressing of opinion</i>	<i>3.85</i>
<i>Reorganizing or redefining</i>	<i>3.85</i>
<i>Need for alone time: Interest in reflective thinking:</i>	<i>3.85</i>
<i>Openness to experience and ideas and not frightened by the unknown</i>	<i>0</i>
<i>Need for and-or demonstration of autonomy, self-discipline, and self-direction</i>	<i>0</i>
<i>Elaboration</i>	<i>0</i>
<i>Analysing</i>	<i>0</i>

8.2 Finding 2 (RQ2)

The second research question is phrased as:

*What **teaching strategies** design educators use to nurture the design students' ability to generate ideas?*

Through a series of interviews, various teaching strategies have been identified. (For details about the administration see section [7.3 on page 139](#)) The next pages describe the results deriving from the interviews and provide quotations that support the findings – teaching strategies. Using quotations is a way to introduce ideas of others (educators) directly to this dissertation (Turabian, 1996, p. 73). All the quotations provided in this section are carefully selected and serve a specific purpose. Carol Ellison (2010, p. 130) provides some guidelines on when to quote. Only the guidelines that are appropriate in this thesis are mentioned:

- The quotations establish examples that support the topic (teaching strategies).
- The quotations match the exact words of the speakers with their own words.
- The quotations are quoted at a length that is considered good enough to enhance the reader's understanding but not overtake the argument being said.

Moreover, all interviewees were anonymised, and their names have been replaced with "Person" followed by a number. The number loosely follows the order of the interviews as they happened, e.g., Person 10, is the tenth person to be interviewed. Finally, all participants in the quotations are referred to in a feminine pronoun in an effort to anonymise participants.

Table 61 on page 166 showcases various teaching strategies identified through qualitative analysis. As explained earlier, the participants were never asked explicitly what is their teaching method. Instead, they were encouraged to elaborate on how they foster or promote the ability to generate ideas. Each strategy's title is loosely defined with a short keyword for convenience's sake and should not be seen as an absolute or universally accepted way to describe these strategies.

As described in the research design chapter (section *7 on page 126*), there are two primary reasons for not asking explicitly what their teaching strategies are:

1. To avoid guiding educators by answering specific teaching methods or teaching strategies. Instead, let them explain by sharing real-world examples.
2. To make educators think about personality traits and then talk about what activities or teaching methods they do in their classes, as an effort to foster the ability to generate ideas.

The quotations provided in this section include several grammar and syntax errors in the interviewees' natural speech. The text has not been edited or modified by any means, other than anonymising the data and converting all gender references to feminine.

Table 61. Identified teaching strategies

N=24	%	Title	Brief description of the strategy.
8	33.3%	Questioning Authority	Encouraging students to question the brief or the client, or challenging their teacher, questioning the obvious or assumptions etc.
6	24%	Critical Conversations	Having a constructive, argumentative dialogue with the students. Doing things such as but not limited to being critically positive, encouraging students to support/defend their work verbally, discussing what works and what does not, explains why something is better than something else.
5	20.8%	Real-life	Challenging students by asking them to work on real-life projects based on the actual world, such as working on local/global authentic problems, designing for genuine brands even if it is just a (non-commissioned) school project etc.
5	20.8%	Supporting Environment	Creating a supportive environment in your classes where every student feels valued, included and empowered. Encouraging students to ask questions (including stupid questions), allowing them to make mistakes and be supportive overall.
4	16.7%	Empathy	Engaging students to adopt an empathetic perspective by understanding how their user/audience feels and their user/audience's situation and motivation.
4	16.7%	Expanding Experiences	Encouraging students to enhance their experience and understanding by doing various things such as but not limited to encouraging them to try new things, going to museums, watch documentaries, learn about different perspectives etc.
4	16.7%	Student Interest	Encouraging students to seek their own interests and then build your classroom/teaching upon those interests.
3	12.5%	Workbook	Maintaining a collection with 'half-baked' ideas, with sketches, notes, and other unfinished work, where students can see their ideas progressing and evolve over time
3	12.5%	Toolbox	Giving many idea generation methods to students and encouraging them to try them out. Building up a more extensive 'vocabulary' with methods, techniques, and various tools that designers can use to develop ideas.
3	12.5%	Autonomous	Encouraging students to work independently and expecting them to take decisions on their own.
3	12.5%	Frustrate on purpose	Make students learn through adversity. When they ask, 'Is this right?' let them figure it out by themselves.
3	12.5%	Framework	Provide clear guidelines on how to operate, and guide them through the design process, step by step.
3	12.5%	Lead by example	Demonstrate examples of their own work or become the 'guinea pig' and test the students' design concepts. Show to students that you are doing 'fieldwork.'
2	8.3%	Verbalising	Make students elaborate and describe their ideas, forcing them to develop ideas by saying them out loud.
2	8.3%	Team member	Split the classes into groups and become (the instructor becomes) a rotating member of these teams, hopping from team to team and contributing as you were a student.
2	8.3%	Affinity diagramming	Make students use mind-maps and affinity diagrams, and encourage them to explore connections between ideas, typically with post-it notes or other similar means.

Each strategy mentioned in this section is essential, and each strategy has a role and a purpose in design education. They all have a common feature: all have been allegedly used to promote or enhance their students' ability to generate ideas. However, they do not have the sole purpose of improving the idea generation ability. Still, they have a multi-varied purpose, as design education entails developing a wide range of abilities and skills. Generating ideas is only one of these abilities, next to many others such as teamwork, presenting or receiving criticism.

The following pages provide quotations with the exact words from the educators. While all strategies are essential, the seven most favourable are covered in more detail and with extensive quotes from the interviews, providing depth and clarity as they are being used on a follow-up survey found in the findings section of research question 3 (section [8.3 on page 199](#)).

However, the remaining eight strategies are also briefly explained with shorter quotations.

Due to the constructivist nature of this study, it is possible that with another set of interviewees, the identified strategies and their order could differ significantly.

8.2.1. Questioning Authority

Encouraging students to question the brief, the client, their teacher or the status quo is a popular teaching strategy. Person 13 said that she always says to all age or experience does not equate to better ideas. It may only mean that she has a more systematic way of working with ideas through a routine built over the years. This statement immediately puts the students a sense that they too produce ideas that exceed quality compared with their professor's ideas. Person 20 is an educator who even gets excited when students come up with things that she did not. Similarly, Person 8 is eager to be challenged and convinced of a different idea. Educator Person 15 is in another position but with a similar stance. When students develop conventional ideas or conventional ways to address a problem, she tries to get them to think beyond the boundaries and questions them to make them get in different thinking, questioning the obvious. Similarly, Person 4 is also encouraging students to think beyond the boundaries. She encourages students, if there is a good reason, even break the boundaries and go beyond.

Person 13 - Questioning Authority

Just because I'm an old Professor, it doesn't mean I am more right than you are. And that always stuck with me and it's the same about ideas. Just because I am 20 years more experienced than you it doesn't mean that my ideas are better than your ideas. It just means that maybe I have more routine to recognise a good idea or I may have more or routine to realise my idea. But your idea can be just as good as mine

Person 20 - Questioning Authority

So I really like the ones that challenge what you are saying that they are a bit naughty, in a way, but they are hard workers and they come up with things that I didn't think about. I think that that's for me. That's what gives me energy somehow. If I'm the one vomiting everything to them, and they need to eat it. I think that that's horrible. They already have a mother and father, they don't need another one."

Person 8 - Questioning Authority

I'm not gonna be a hypocrite. First I do have my own set of preconceived notions as well. Of course, I'm only human, everybody has their biases. But I really like when I'm being challenged myself as a teacher, I've never been one to be stubborn. So I like it. That's why I like about teaching. Because I learned to, I challenge them, like change my mind or something like that. And then when they actually get to convince me otherwise, I'm pleasantly happy as well and actually admitted in class that, oh, that's an interesting point of view. So in that way, I also learn from the class. Remember, we're talking about a different generation already. So that's what I like best about teaching. I think that's it, because I learned as well, it's not just one way. So I think this idea of changing one's point of view applies to me as well.

Person 15 - Questioning Authority

in school, I think the really important thing is to experiment with the different ways you can and explore how you can transfer that thought from one person to another. So definitely idea generation in school allows you to experiment a lot more and this is a challenge because a lot of the students want to come up with things that look very commercial. So, they want to do something that really looks finalised that looks like it's a real project. And I try to push them to think outside those boundaries. Because they're very often fixed on one idea. You know, their original idea is maybe doing a brochure to solve a problem. But then I try to push them to think I mean, is that really the correct medium for this message? maybe you should do a poster, maybe it should be a screen on the back of a taxicab you know, I don't know, anything, just to get into thinking in different terms. So because when they start working in it as professional designers, they will very often be locked into the client's restrictions.

Person 4 - Questioning Authority

"Sometimes compare to these new computer games, which you have these open worlds. But actually, they're not really open. They seem open but there are a lot of stories already in there that you are basically forced to walk to. And of course, I always try to force my students to give far too great boundaries. I say these are the boundaries if you a very compelling stories way to sort of step over this boundary, do it! You're free to do it, but you have to... you cannot just do it, you have to be a good reason to break the boundaries. And sometimes the concept is the boundary. So we say, well, the concept is dig deep"

8.2.2. *Critical Conversations*

Having a constructive, argumentative dialogue with the students is another popular strategy in design schools. Sometimes it is called critique or abbreviated as a crit. It is also a signature pedagogy, explained in subsection *The Critique on page 54. One of the interviewees' accounts is raising questions for discussion, such as what makes a gift a gift.* Person 12 has been using this question as a thought exercise with her students. Person 3 also makes a terrific remark regarding this teaching strategy. Relating to the previously mentioned strategy

On page 168 an educator encourages students to “question the obvious” and to visit the less visited places of their brain, starting an inner dialogue questioning why. Person 17 makes a humorous remark claiming to question why and why like a four-year-old kid. As an educator, Person 17 claims it is not difficult to judge if student work was original or if someone else had done it, and they presented it to her as if they did it. Regardless of the case, she considers it a pleasant opportunity to have a lovely dialogue with them, asking them many questions about the work. Person 15 offers a different account; that design cannot be taught. Instead, it has to be done, which makes teaching design challenging. She considers the educator's role is dialogic, offering feedback without claiming what is right or wrong. Students find it hard to comprehend when they do not have a clear ‘that is correct’ or incorrect response, and as a designer and a musician, Person 15 gives a good analogy that a song can be written in 1000 ways, and there is no right or wrong song. Admittedly, this is somewhat overlapping with another teaching strategy, the “frustrated on purpose” (section *8.2.11 on page 193*).

Person 12 - Critical Conversations

We also looked at a case, what is a gift? What makes a gift a gift? Is that a little ribbon that that you open to reveal? So we're looking at other structures and patterns and we can really help to provide you the thoughts and helps the situation to understand better.

Person 15 - Critical Conversations

I sometimes say that you can't really teach design. You've just had to do the design. So I always compare it to learning an instrument, musical instrument, you come to me about learning, playing the piano, you have to play the piano. So you have to start using it then start experimenting. So our role as teachers are very much giving feedback. I mean, that's our primary role to give feedback on the work, to follow them through their projects. And one of the things that I've had the students have the hardest, and the hardest transition for them often when they start in the design courses is that they expect us to tell them when they're doing the right or wrong thing. So they want me to tell them that this was the correct solution. This was the wrong solution. But when we say that there is no wrong or right, there's just different paths to towards the same call. That's something they have a hard time sort of adjusting to. Sometimes, because I'm a musician also, I often do composers with music and ask them to imagine if you were writing a song. There wouldn't be a final correct solution to a song. There's got to be 1000 different versions. So that sometimes helps, it helps them there to understand how we think, and that's definitely a part of creativity to sort of accept that you're not on the path towards the final solution, you are towards a way to a solution, which will be different depending on both the client, the project, and the kind of project you're working on and so on and so forth.

Person 03 - Critical Conversations

the first the first course on The Bachelor level in my programme is idea generating and sketching. That is the name of the first the absolute first course. So we, we try to put them in that mindset from the start. And we say that we say it straight out. We don't expect you to be have formulated the perfect answer is we don't expect you to be complete. We expect you to be open we expect you to, to, you know, visit the less visited places in your brain. And to really one thing that we say often is to question the obvious because sometimes that you think that a few things are obvious. And then you can maybe question other things, but we say we encourage them to question even the obvious things. So I think that it's, at least at my programme, it's on the top of our minds when they start.

Person 17 - Critical Conversations

Basically what you're evaluating there is How was the creative aspects of age or how will how innovative is this? or How was the development of the project? Because that's another thing that we did a lot. At least in the classes that I taught. We had a lot of meetings with the students, a lot of consultations to do to see the development. So it was never that I got a project without knowing what the student was going to show. I always had an idea already of what they were going to show and in this kind of consultations, you could always have a bit of a confrontation or a conversation with them, to see what they were developing and to see if they could improve their project, no matter what bachelor they were studying, it was always a good way to know what they were doing. So it was never a surprise that Project was never a surprise for us, like, Did you do this? Because sometimes you would. I mean, from my own experience, when I was a student, I would see some of my classmates, bringing some projects that you knew, immediately saw them and because of course, you spend so much time with your fellow classmates, you know that they didn't do this. And for us, it was very important to have this consultations because it would improve the process, the creative process of the students. And also, we knew that the students were the ones who were doing the projects Not that they were asking some of their friends to do it. But it was also very interesting because if it would help you have a nice dialogue with him. And to help them discover better ideas or to improve their ideas or sometimes even if they Had a good idea it would be very funny because I would ask my students Why did you choose to go this way? Or why did you choose this subject? or Why did you define this concept? And sometimes they would not know. And so I used a lot of I don't know if you could find it like this, but for me, it was a bit like, I'm using my duty. And I don't know if you pronounce it like this, like the Socratic method, you know, asking them questions, always asking them questions, and today would arrive to their own true, so to speak. I don't know. It sounds a bit weird, but, but it was I was always asking them questions as if I were a four year old kid. Why did you do this and why and why?

8.2.3. Real-life

Description: Challenging students by asking them to work on real-life issues, doing things such as but not limited to, doing design projects and assignments based on the actual world, working on local/global authentic problems, designing for genuine brands even if it is just a (non-commissioned) school project.

Person 12 was asked if students submit project briefs based on their own fictional project ideas or get a fixed project brief. Below is the detailed response:

Person 12 - Real-life

These are all different, like for instance, last year I was doing a museum exhibition, then I take the class and make different groups. Not too many groups, but like small groups of three or four. And what it does the groups actually fight among themselves, like they have to come up with the best ideas to be selected and stuff like that. And then the client, usually get the opportunity to pick up the best best group, that would begin the design part but when it comes down to execution the entire class would get involved with that, so the entire class, whichever was the best design they choose, but the class will participate in the hands on making things you know, building installations to whatever they have to do to make that exhibit success. So they will do that. And not many hours that we don't like we are not restricted to classes all the time because I tell them you cannot just spend like two and a half hours in the classroom and twice a week to finish big large scale projects and stuff like that. And these are pretty big, large scale projects we're talking about. Now, like for instance, we are designing a feature gas station for a company here, a corporate. So, the initial was like designing not only the look of the place but also how things are going to change with technology, the predictions of things, how cars are going to be not using gas anymore. So how what is their business model looks like so everything that has to be designed and prototypes and present and all that. So from that to again, when we did work with Amazon again that group, but it wasn't one single group. So everybody was working like a professional came up with ideas, because, because you have to study the logistics, you have to study what people do with with the boxes they receive, how they recycle, or reuse or what are the carbon footprints added to the boxes like you know for Amazon, kind of a company like an e commerce company would take, okay I will take a recyclable box or these are biodegradable box that will go to a customer and it is all good but when we present that we said it's not good, because, I'm putting into the recycle bin that has to be taken to a like a sorting centre. So, the garbage cans then they will pick it up, they will go to a sorting might be able to break the box and make a product out of it at the centre or maybe you have to sell to the next centre. So the additional carbon footprint, not only the vehicle but the human beings, a factory or recycling centre light and electricity, so many added things comes with it. So it's not in pure terms. Even if it's a biodegradable model, but you cannot say that I'm making like environment friendly packaging. So, from looking from that perspective to every perspective of the making of the box, why they do it this way, because any any e commerce company would use a standard design, because the universal box as they call it is has the less waste when the way manufacturing but is that stops there or is it like, it adds stuff like when we when we present it we also said hey, look at the new design, but we also said what is the problem with the old design, which is all over the world accepted as an universal box design. That's the ultimate form of design, but you're adding things like you got to put a tape on the bottom you have to pay for a tape on the top, so, you're adding things. So, is it that the tape is goes waste with the with the box itself. So, is it in true form like a biodegradable or abandoned trolley box? Probably not. So the cost element to it the you know the workmanship, sorry the labour cost and all that stuff the time required for those boxes, when we calculated all that stuff and and then designs and prototypes and actually demonstrate that. So, Amazon was very much interested in long term which we are working on our paper, all this paperwork is the most challenging than what design is. So, yeah, students are involved in very real world, hands on problem based solutions.

Person 17 - 12 - Real-life

it's about giving back to society and being able to build a better world, and so, we always had a project that was based on social marketing and this is where I think we used to apply the creative process, because first you had to check what problems are there that are of your interest, like what topics interest you in society nowadays, and based on that, find what is a problem that is associated to this topic? So it could be the deforest station, it could be sickness or dogs or animals without shelters or all these things, you know, and then they had to investigate or do some research on what kind of organisations were there in the city that could help with this project and then we will contact all these organisations, we always work with the organisation itself, to make a campaign of social marketing to to make people aware of this problematics. And to make a bit of change. And with that, for instance, one of the ones that we were more most proud that we helped, one of the hospitals in the city, they have one of the most important blood banks in the city. And the campaign's that they used to do to call people to donate blood were very dull, the ones that you always see, but we came up with with a metaphor and we came up with ideas and design a special kind of communication, posters and graphic pieces, you know, graphic material. And we used it as a test in our university, the hospital came with their equipment, make a blood donation day. A lot of people donated blood that day. And they took this idea to other universities and to other places and the people from these from this hospital, we're super happy because they saw a big change in the way people would look at blood donations, like how people were more helpful and how people were more interested in the message was better understood because of these changes that we did. So for me, that was basically The idea to be able to do some research to be curious about something that is happening in your environment and to come up with ways to help solve that situation in that in that particular context. And well as I told you, my own personal approach was to be able to give out or to give back to society without you know, just not working for someone like Coca Cola or Nike, but to be able to, to do a change to have some impact in your own society. But not necessarily that that's necessarily creativity. I mean, that's just humanity.

8.2.4. Supporting Environment

Creating a supportive environment is a crucial teaching strategy that can empower students. Both Person 7 and Person 9 deliberately try to create an environment where no question is considered stupid. Person 9 suggests that teaching students how to play can nurture this sense of safety. Person 17 says that it is typical to use your time at university to make mistakes because you cannot make mistakes outside of it. Despite the sense of cliché, she agrees and argues that having a platform where students can disagree is quite essential. Speaker 24 provides an account of an accident, which perhaps sounds comical, in which two students who did not get along were accidentally in the same team. Eventually, they supported each other as they figured out how to supplement each other with their skills through a safe classroom environment. One more helpful remark by Person 21 raises concerns about whether design education prepares students adequately for the transition from the classroom to the workplace environment. She states that design education ought to make students think about the psychological environment as well.

Person 17 - Supporting Environment

Also this thing about how to make the space or the class a safe. Yeah. let's call it a safe place. Um, well, you know, there's this typical kind of phrase that says, use the time that you're at the university to make mistakes, because then you cannot make them outside make all the mistakes you want in here because you're in a safe place. But that's a bit common knowledge. And for me, it was about being able to have classes that would mix not only the theoretical aspects of the, whatever class I was teaching, I can tell you for, for instance, about this communication at an advertising classes, making it like a dialogue in which everyone could feel welcome to ask, to add things, to say things, or also to to disagree. They could also feel that there was no problem in saying, I don't agree with that. I think otherwise, I think it's always interesting because other students can make their own mind. It's important to make up your own mind, having information and having everyone able to participate. So for me, basically, that was one of the things to have this respect for each other's opinion. And I think it helps with a flow. Because if you're not thinking that you're going to be judged by what you say, then you can flow and you can have more ideas and you can have more progress.

Person 24 - Supporting Environment

So I accidentally designed in a team this year that ended up with two really hard headed people in it. Like, Dear God, neither of them wanted to be wrong, neither of were wrong and neither of them could agree with each other. And the poor rest of their team, were dying from it. But it was really funny that by the end of the term, and in turn one, they actually found that they were most useful to each other. Because when they were challenging each other all the time, and they got a whole lot better challenging each other because when the first couple weeks they were splat out yelling at each other in class, and I would have to go over and I was like, respectful tones, respectful discussion, you don't get to to yell at each other, sorry. And they got better and they stopped doing that. But by the end of term, they were working on things just together the two of them, and they're just like, yeah, no, it's great because we can go back and forth with each other and get our ideas better because they helped me change but he helps me change that. So by the end, they were able to see that kind of confrontation of their idea was not saying that they were wrong, or they were bad personally, but that they didn't like something about what they were doing. And that maybe they need to think a different way. And in turn to I always give the groups a chance to switch. And ironically, I thought that group was going to be the first one to come up and be like, Look, we need to switch people. They stayed together, and that was just crazy. But yeah, they ended up being great. So they, they learned it through that adversity, and I am okay with them, learning through that adversity because if they do it in the classroom, it's a safe environment for them to learn how to work with people like that, or, you know, follow away from those things that they tended to do, because as soon as they start doing in the workplace, they're going to be fired.

Person 21 - Supporting Environment

I wonder if we are preparing our students to be adaptive without fear from one environment of learning to another environment of profession. So I think it's just not only the physical environment, but also the psychological environment that we need to have our students working.

Person 7 - Supporting Environment

I think I tried to pay attention to creating a space where people feel like they can ask questions, that they know that we learn from each other, because quite often the students or people have this impression, that I'm afraid of asking questions because I don't want to be perceived as stupid in front of my peers. so, I am trying to get rid of that. Otherwise, I've been thinking a lot about this approach that it can easily sound a bit kind of laissez faire, because I face myself out of the picture, but it's not really bad. Like I'm just like trying to make myself invisible. So that you know I'm doing when they need me or when I feel that they might need me.

Person 9 - Supporting Environment

Well, I think it's really important that students feel safe, also. And usually the first few students when they compare a large group of people, they haven't met each other, they don't know each other that well, and they tend to not be that creative. Even the way I can sense that they are in a way, because they are afraid of what other would say and so on. So, that's also something to also nurture safe space or creative haven, where they can see, okay, now we clearly need to be playful and just let everything out and don't mind, don't be foolish or whatever. To teach them how to play is important, I think we need to do that.

8.2.5. Empathy

Encouraging students to adopt an empathetic perspective is a rather popular teaching strategy that reflects designing thinking. It helps students understand what their users feel and the motivation of the people they are being to design for. Person 3 claims that understanding how people think and feel is only one aspect, but to get a complete understanding, trying how people think and feel is part of empathic research. That connects to changing one's perspective, challenging as students are often young and do not have a mature personalities. Person 12 talks about how using briefs based on real-world problems help students explore opportunities and develop novel solutions. She also adds that pairing students with other departments force them to discover new situations where they understand other fields and expand their experiences.

Person 3 - Empathy

I think also the first time when you have, you know, be able to change one's point of view, I think that is, that is so important. In [country], we call it an empathic research, you know, where, you know, you don't just try to understand how other people think and feel, or so you have to try yourself. Try to be that person will try to think like that person so that it's kind of connected to that I think, to be able to change one's point of view. And I think that can be hard for new students sometimes because they're kind of unsure who they are already. And to change the point of view is scary.

Person 12 - Empathy

Two things that I suppose I do a lot or we do a lot at the school I'm at now is more than 50% of all the briefs that we work on are the things that we work on are with actual community partners. So students at undergraduate and graduate level work with people with real issues. We do a lot of work around kind of health, community social issues. So often our students will work with that. Right now I'm writing a brief we're working with an organisation that attempts to address homelessness. And so our students work on briefs like that. The two things that we've been that we do a fair amount of that I think force creative opportunities our students working on, sometimes we would say real their live briefs, so not a brief I've just made up or a standard brief that is off of some award site or something so actual real people come in from our partners, and our students need to then work on that. So they have to react to real problems, real briefs, real challenges, and respond to those things. And I also do a fair amount of work where students are working on interdisciplinary projects. So they're paired up with students in other departments or other fields. So I just completed a project where, by design students worked with students in medicine on projects, and again, that forces, new situations for both those types of students to try and understand the fields, the languages, the experiences. And I think that also brings out some opportunities for some of the things that you're talking and thinking about for creativity for unorthodox responses to things, things like that.

8.2.6. Expanding Experiences

A teaching strategy that has been talked about frequently throughout the interviews is encouraging students to try new things, enhance their experience, and understand by seeking knowledge or doing things they have never done before. Person 9 makes students see things from new perspectives, such as experiencing the world as a blind person or in a wheelchair. Person 15 has used the museum to learn and watch documentaries with students. Another approach to boost creativity with small effort is to make students discover the creative processes of creative people they admire. Person 17 has been promoting this type of exploration by seeking easily accessible information through online videos or articles from popular magazines. Grades can also be an effective mechanism to make students expand their experiences. Person 22 explains that some learners will not settle in one solution but rather keep seeking more solutions, and this type of willingness to explore is rewarded with bonus grades. As she explains, she benchmarks levels, adventurous, *familiar adventurous on unfamiliar adventures*. Finally, Person 23 offers a risk bonus that can help students boost their grades.

Person 17 - Expanding Experiences

I always invited them to look at what creative people that they admired would say about their own creative processes. That's one of the things. There was, in this creative thinking class we made them do some readings about the senses. Because we were also talking to them about how to be conscious of how you get information from all your senses, not just the five senses that were always taught, but they expanded kind of being able to expand the senses, not just five. There are some researchers that they that we have 12 so we made them read something about it and how we connect to our bodies and this is a bit not so much into the creative aspect, but more know yourself aspect, but we also made them read some documents. One of them was David Hockney, this photographer, you know, the one that makes photography. He makes a big photography out of little pieces of photography. And so we would make them read an article or a text that he wrote about his own creative process. I would invite him to do that, to be able to read articles about designers on how their creative process was, or to watch documentaries on this. Not just the theory of creativity because yes, of course, sometimes they would have to read something about from Gardner or the Bono or Csikszentmihalyi or James Webb Young, well these authors, but also like something that is more connected not so much from the psychology aspect of creativity, but like hands on creativity, like a documentary about the creative process of Alexander McQueen, for instance. Or if you look at some movies, there are some of these extra material like bonus material, and this is something that I always invited my students to do. Like when I was teaching the guys at the Fashion Design faculty. I told them like look at designers that work in movies that that you like, or if there are any movies that you think or whatever, that's that design, like the wardrobe or the fashion design of that movie is amazing. Check out what is the costume design and if you can get the DVD version of that film, and watch the part in which because there are some ways in which the designers explains how they did the creative process for those particular dresses. And, that's also a way to learn because then you see how their creative processes were, how they start designing. Yeah, what kind of research they do. And for me, it was amazing because most of these designers always said they had to go to do some research. And for me, it was always telling the students find information and do research, you cannot start drawing without knowing what you're going to draw. And for a specific project, you can come up with ideas out of your mind, but if you're doing a specific project and you need information on that project? And so they would start looking for that and I don't remember the name of this Japanese designer. She did. Let me check it out. She did the design for Star Wars The Phantom Menace. And so for Phantom Menace that was Trisha Biggar and she explains how she had died some of the fabrics and how she looked into Chinese and Mongolian wardrobes and Paulk traditional dresses. It was videos. There was another one, this one is amazing. Eiko Ishioka. She was a Japanese art director and costume designer. And she designed amazing wardrobe for Dracula. They fall and even for one with that is like Snow White, but it's with Julia Roberts. I don't remember the name of the film. But this woman, you can see the design that she does and where the inspiration comes. And you can really see her process and there are some documentaries about it or some articles about it. So it's not thing very academic, but it's information that they can find. And I mean, just look at your own discipline, who are the people that you admire in your discipline and check what their creative process was. Or something that you admire, even if it's not in your discipline, but if you like the process of a sculpture, for instance, and check it out. I think it always gives ideas when you take it out, and the better even if it's someone outside of your discipline because it helps you see if they have something that you can also apply in your own design or in your own creative process,

Person 15 - Expanding Experiences

Oftentimes, you know, learners will will say, you know, I just want to find the right solution, kind of like a math problem, and then design and say, finally, I solved that it's over. Instead, like the willingness to say, I'm gonna find one solution or one way, and I'm not going to stop there, I'm going to continue to explore, there might be another way. And there might be another way. Let me try this way. So material that to pull from the second level is the willingness to not stop at the first one, but to continue to go. And then I'd say that next step on top of that, one, is the ability to evaluate what was created and to make this as easy analytical thinking, to be able to the willingness to analyse what was made and then make variations based on that one, depending on what's deficient or what's missing. And it's like, well, colour right here is not as strong. Let me try a different colour combination, or I've explored all of this same kind of typographic arrangement, or this app seems to be working fairly well. But what if it were actually a paper system? And, and so the end of the content to be creative, you're the willingness to continue to try and try and try and try and then the ability to evaluate what was tried to then know what to do next. It seems like so ways I have tried to spark that one of those in my classes I for many projects use what I call experience points. Students get graded, and one of the parts of their grade for a project is their willingness to be adventurous to try new things. And three different areas did they engage with people that they had never dealt with before? Or examined or had never studied before? Have they done an activity that they have never tried before? and explored an activity of doing something that's new and novel? Or have they gone to a place or put themselves in a context where they had never been before? And I have different levels of adventurous, familiar adventurous on unfamiliar adventures. I'm familiar and comfortable with the three or the three levels. Adventure it says I've never done this before. This is a new thing for me. unfamiliar is I've kind of done this before but I'm doing it in a new way or I'm meeting new people in this way I tried a new food or whatever that is, and then comfortable. It's Oh, yeah, I know this. I interviewed a friend I already knew I didn't really talk with any strangers. And the hope with that on the projects that I build is to challenge learners to get new experiences. That's kind of the source material for that creative process. So I've been trying some students respond to grades, and they can be very achievement oriented. Oftentimes, trying to use those grades actually fill their tanks with new experiences that then lead to at least they're in there, then we can start working on combinations, we're gonna start looking at a creative process to use those experiences to find solutions and outcomes that are unexpected.

Person 9 - Expanding Experiences

I want them to see things from new perspectives. So, we practice the different methods so they should take a bus tour into town and experience how it is to be blind, for example. to experience a walk in the school corridors, in a wheelchair, and so on.

Person 15 - Expanding Experiences

what I did was I, I watched a lot of documentaries related to sustainability, together with the students and then I let them discuss. Then I actually made a collaboration with the biggest Science Museum in [country]. And then I brought the students to the museum and like over two days, they observed students and parents and families. And then they had to come up with exhibit or like insulation, art or some kind of activity that could be used in the museum that's sort of conveys the learnings of them, like, watching these documentaries and reading materials. So really, really challenging topics, but how to turn that into bite sized information, and also entertaining a medium in a museum. So that was the topic. So students had to do a lot of ideation too.

Person 23 - Expanding Experiences

I've done a lot of work in this area early in my career just in my research where I wanted us to learn what risks, like what is real risk for students, like what do they define as risk? How do they see that these are undergraduate students especially, and I had in my projects and my project assignments, the big ones, I do a risk bonus. And the risk bonus, it gives them a letter grade back, they, you know, the ABCDF, if they take a risk on a project, if they try something that's really risky, they try a technique or they try an approach to a new product or media or an idea that that they're not quite sure of but they push through it and they continue to pursue it. When we're doing critique, I learned them like you're a candidate for a risk bonus here like keep going, this is hard this is going to be I'm not sure if this is going to work but keep going you can earn the risk bonus here if it doesn't work out. And so essentially what I do is, if at the end of the project, and they know this before I tell them you know, like you can take risks here you have a safety net If at the end of the project, they tried something and it means that it were they did not achieve the learning outcomes, they did not perform well on the assignment on the learning outcomes, then they get a letter grade back, I can bump their grade up. So if they got a C because of it, now they get a B, or if they get a B, because they tried it didn't quite hit, they get an A. And it seems, again, these are students that I'm working with that are quite grade focused, it seems that helps some take risks, and try some of those new things knowing that they're not going to be penalised for, if they fail. Oftentimes, when they take risks, it produces a far higher outcome than they could have ever done before. And they don't need the bonus because the grade is like really, really high or is more advanced because the risks they took produced a stronger outcome. So yes, I put them in new experiences to challenge them to push themselves to learn and take risks, and then actually have some functional ways in assignment. That reward them for taking risks.

8.2.7. Student Interest

Some educators reported they encourage learners to seek their interests and then build their teaching upon student idea-inspired projects. This approach is believed to increase engagement and attentiveness, which can consequently result in a better, more effective learning (Renninger, Hidi, Krapp, & Renninger, 2014). Person 24 asks students to dive into their interests and explore what challenges they can think of from their own experience. The students then determine what is problematic (depending on their own experience), which becomes a starting point for assignments. Person 20 uses a similar approach, encouraging their students to envision themselves, encouraging empathy. Within this empathic context, she encourages students to use their senses and bodies and immerse them into the problem. As she elaborates, she states that *“a problem that you have not touched, is a problem without a soul”*. One of the assignments that Person 20 uses to draw upon the student interests is to ask them to re-work on previous work, making students explore different possibilities and new opportunities. By letting students work on projects that they chose based on their interest, passion becomes a crucial component in the process. Person 19 describes how giving students the freedom to explore their interests brings their passion, flowing back into the projects.

Person 20 - Student Interest

what I'm really interested and what I do, in my personal research is using embodied ideation, so what I just said before, so the use of the body, the use of your own personal experience, the situatedness of you in the context where you are, as a way of supporting your idea development. So, I always tell them that if you are sitting on a chair in front of a computer. That's your context of application. The more than you can imagine a different world, the more than you can imagine that you are someone else at the end of the day, you are, who you are, and you are where you are. And it's the situatedness that influences your design. So, if you design sitting on a chair using a computer, in this process will affect the way that the users will understand the product. I tell them all the time if you need to think to design, the end users will need to think to use, so if you explore with your own body, the process of designing then if you experience the design process that people will find meaning in their experience. And that's a bit like my way that I support them in being creative, so it's not really telling them how to do, but that they use their full sensory reality, that they use their own body, that they use their own experience. Because a problem that you haven't touched it's a problem without soul [...] I hardly ever propose a challenge that are not the ones choosing what to do. So normally if what I'm teaching is something that requires a transformation, a transformation in the way of working or understanding a subject, normally what I do, I asked them to redesign something they made themselves before. So in this way, I think it's really nice because then they can really see I've done this before in this way. Now I've done it with a different material

Person 19 - Student Interest

Another project that I give is to create applied illustration for a specific event. And I give them the freedom to choose their own event and tell them that this event can either be based on reality, such as a birthday or wedding or party, or you can use dark humour and really sort of, again, push boundaries and I've had some hilarious responses to this I had babies first satanic ritual. And the particular student created a whole range of merchandise, including a sort of baby warm seat for babies for satanic ritual, which was not an idea that I was expecting. But the way that she actually applied the illustration was so well done, and on first glance, everything very innocent like a regular baby shower. But then as soon as you look deeper into the illustrations, you could see that there was something incredibly off and I've had other students who did much more traditional and real world project answers to this whereby they would correct creating and product design specific to their culture or their heritage. I've had students who looked on one that I really enjoyed was a student who looked into animals that were about to become extinct, whether it was only one left in the species, there's a specific word for it, which again, I can't remember off the top of my head. But yes, he went and researched all these animals and did these beautiful illustrations of the sort of one only unique creatures and what was so special about them? And so there's such a vast range of topics that They could kind of come up with and some of them really surprised me with their I guess passion for some of these things. And I think passion is perhaps a really key word in what helps them to give their very best in their outcomes. If they'd be interested in creating something then I think that flows into the outcome.

Person 24 - Student Interest

So I know some teachers they're like, think hard. Whatever. So I don't ever do that. And I normally take a kind of more roundabout way, and I go, Okay, so you haven't seen anything bad in the world around you or you think everything's fine. Okay, what are you interested in? What's your hobbies? What are you passionate about? What do you like? Do you care about the environment? Do you care about music? Okay, cool. You care about music? Okay, that's great. So, what about buying tickets online? What about the process of getting into a music festival or a club? You know, what could be better? What do you think could be better about those things? What's difficult about those things? And as soon as you kind of start going into an area that they're familiar with, then they'll start at least being like, Oh, I think I can find something. And then at least that gets them to that initial point where they can have some ideas to discuss in their teams.

8.2.8. Workbook

Design educators can make students internalise their thinking process to maintain a collection in a book format with sketches and other unfinished work. This is an important teaching strategy, as there are reports that students rely excessively on software, which can deprive sketching skills (Cai & Hao, 2019). Sketching is very fast and reasonably free of rules, and it is not always pre-mediated. It can produce results that can offer new interpretations (Goldschmidt, 2017). This is why maintaining a workbook can be helpful as a teaching approach. Students then can see how their ideas have progressed and evolved with time. This book with “half-baked” ideas can be a way to help students internalise their thinking process. Person 15 describes what that process entails and explains why maintaining such a workbook is essential. Especially in regards to sketching, there are several idea generation techniques, such as brainstorming, C-sketch, 6-3-5, and more, producing visual outcomes (Worinkeng, Summers, & Joshi, 2013).

Person 15 - Workbook

Let's say they're doing a creating or designing a logo for their project, we will have several different sessions one day where they're presenting the work. So they're presenting sketches, they're presenting the development of the work and in each session, it's presented in front of the classmates, which I find very important. They need to both be able to present their thinking behind the work. That's not something we highlight a lot, that they need to both be able to document what they're doing. So in each course, we use something called a workbook. So they track the process through through the book through the through their work, and then part of each course is workbook presentation, where they are supposed to both present and document the process throughout the course and be able to provide arguments for their decisions. And the point of that is to open up their eyes for their own process, both to be able to present to work into the future and to be able to realise that, maybe that wasn't such a good way to go.

8.2.9. Toolbox

One common teaching strategy is providing students with many idea generation methods and techniques and encouraging them to try them out. It is said that there is an infinite number of tools, each of which provides a specific type of support in the design and innovation process (Dewit, Du Bois, Moons, & Jacoby, 2012). Even using comfortably conferencing tools might be considered handy in idea ideation. In the case of idea generation though, there is an extensive range of tools used individually in a group setting (VanGundy, 1988, 2005). The ultimate aim of this strategy is to help learners build up a more extensive 'vocabulary' with methods, techniques, and various tools. Designers then can pick and use whenever they need to come up with ideas. Person 3 explains why it helps build a toolbox with many tools at your disposal when needed.

Person 3 - Toolbox

I think also that everyone gets stuck sometimes. You run out of ideas or you, you're too tired or you don't have the right circumstances, then then then I think it's very good to have these kind of basic methods that I that I usually teach you I guess you've heard about them all but I have a list here of the methods that we talked about and, and as long as you don't get stuck if you always come up with great ideas if you don't have any problems in in questioning the obvious or being creative then you might not need these methods that much, but most of us get stuck. Even these creative minds get stuck sometimes. And that's when I think it's good to take a look at these methods. Most methods about idea generation is I think, most useful when you get stuck.

8.2.10. Autonomous

Even though leaving the students to work independently on their autonomous grounds may not appear as a teaching strategy. Perhaps it may appear as a signature pedagogy. Nonetheless, it is a teaching strategy that is difficult to implement. It is conflicting that educators have to be facilitators and coaches, assisting students pursue and develop their assignments, typically leading to a submission towards an assessment, which makes it challenging to be developing the learners' autonomous abilities simultaneously (Kimbell, 2020). Nonetheless, as students learn differently and progress at different speeds, it can be appropriate that some students need more help and guidance than others. Overall, encouraging students to work independently and anticipating making decisions independently can help them grow to become professionals. As Person 4 explains, it is essential to give them room early, which will help them professionally as soon as they enter the labour market.

Person 15 - Autonomous

And after some years of teaching, you somehow get this feeling which you can almost taste, feel that some students that they need this little bit of extra guidance, they need just different types of people and some are very good in very open and free approach just, you know, let them go and they will find out themselves, they can self-organise by themselves pretty well. And all those finally basically only have to be updated about their process. And so give them some tips and hints. With some other two students, you really have to explain them step by step, every step they should take, then it becomes very difficult because I think you shouldn't steer too much. Now you want to give them the possibility to, to discover their own path, because if you don't I think they will have problems later on because as soon as they're graduated, there's no one to show set up, set out they're little steps, they have to discover themselves. And if you don't give them enough freedom to be able to discover this, how to set the steps themselves, well, then they will have problems.

8.2.11. Frustrate on purpose

Some educators may appear to be ruthless, frustrating learners almost on purpose. It sounds mean and immoral, but the intention is not to harm learners but make them learn through adversity. When they ask, 'is this right?' without ignoring the question, instructors divert their response and make the learners figure it out by themselves. Under-specified briefs can be painful to learners, but instructors give them on purpose, as they believe it is a tremendous challenge to prepare them for the industry (Ntf & Kelestyn, 2021). Person 24 describes how students learn to deal with it over one term and explains how they become more tolerant through this teaching strategy.

Person 24 – Frustrate on purpose

when I'm walking around, a lot of times, we'll go is this right or is this good and We'll always say I will never tell you if it is right. And I will never tell you if it is good. I will tell you if it is wrong. And I will tell you areas that I think that you could do something better with. It kills them. But by the end of the term, they're fine with it, and they know how to work within it. So I say that that's a way to make them tolerant to it, just beat it into them with like, give them very detailed feedback and straightforward feedback when they submit the actual assignment. But don't hamper that creativity. Don't hamper that idea generation. Don't tell them right or wrong that way.

8.2.12. Framework

Providing boundaries or defining a space where students have to work can be regarded as a teaching strategy. Perhaps this is similar to what the industry would call a design brief. Setting some boundaries and at the same time giving some room and allowing students to experiment and explore and even trying to look beyond the limits can be one of the ways to promote their creativity. Person 4 explains teaching within the sweet spot between wide-open and too narrow boundaries, creating a framework in which they can operate.

Person 4 - Framework

Well, so that's when I found the most difficult to find a topic because if you don't do any topic, my experience is it doesn't go anywhere, because then you let them go lose the students, and you need to have them some stuff they're gonna hold on to. Right? Otherwise, it's just all over the place and just make something doesn't work. So, need to have some framework in which they can operate. And often the results are better. I think. The more, the more clear the constraints are, but you don't want to have the constraints too narrow because then you just get the same result becomes effect. That's not what you want. You want to have creativity in there and so for me, creativity is problem solving, and looking beyond boundaries, exploring new possibilities, discover stuff. But without boundaries, it doesn't go anywhere. They stay often too much in their own comfort zone. So, to forced out them out of their comfort zone, you have to give them a sort of above where to go to but this path has to be wide enough, they can still have the idea that they can sort of walk free.

8.2.13. Lead by Example

Some educators may demonstrate examples of their work or become a 'guinea pig' and test the students' design concepts. This approach aims to show students that you are doing 'fieldwork', including producing and testing products and collecting feedback or data. Person 13 explains how she has been using a furniture design course as a platform to encourage risk-taking by committing to testing chair designs, even wobbly ones, and accepting the repercussions of that risk.

Person 13 – Lead by Example

I used to teach a furniture design course and every furniture design course has to design a chair. And it was always a rule. Every chair they produce, I will sit on it, no matter how dangerous it looks, so how wobbly it is, I will sit on it. And if I fall down, I fall down, then that's my risk. And the students actually appreciated that. I tried every single day at the expense of occasionally falling on my bum. And also look silly, making a fool of myself. And I think they appreciate that generally, they accept that I'm taking risk and then they may take risks also.

8.2.14. Verbalising

A relatively simple teaching strategy to make learners develop ideas is to force them to describe the problem in their own words and understand. As they are doing it, suddenly, ideas start taking shape. Simply elaborating on a problem forces the brain to envision solutions on the fly. It is a powerful way to teach learners to produce ideas. Person 3 is explaining that by merely trying to explain a problem suddenly, ideas emerge (quotation below). Moreover, this teaching strategy should be carefully planned for the best, positive outcome. Scholars have pointed out that ideas expressed in a group setting, either out loud or giving shape to an idea on a post-it note, the social influence generated can become harmful to the idea evaluation that follows (Fleury et al., 2020). Educators should be mindful of when and how to deploy this teaching strategy.

Person 3 - Verbalising

A lot of the, the methods, it's built around this very simple idea of trying to explain to someone else what the problem is, or the situation is because verbalising or explaining, it's a way for your brain to structure the problem. If you if you have to describe it for someone else, and you have to structure it, make it understandable. And by doing that, you often see solutions or possibilities without trying, just organising and kind of structuring your situation. Suddenly you see things I mean, that happens even if you're in your private life, you know, if you talk to your friend about your wife, or something, and you describe I don't know how to say this to her and suddenly, it's obvious what you should do. Just verbalising is one of these basic things I think that you can do. It's so easy in design education, you have your student colleagues and you can talk to them.

8.2.15. Team Member

Becoming a team member is a teaching strategy in which the educator becomes a rotating team member in the classroom. As the classroom is split into groups, the educator joins each of the teams, effectively contributing as if she was one of them. This strategy can help students learn from their peers instead of their instructor. Speaker 12, when asked if there is a class where students have to generate or come up with ideas, responded with the quotation below.

Person 12 – Team Member
<i>I don't have a kind of a model. My model is like, we take up a problem in the way I like to teach, because I usually become a team member. So I'm also one of them. And basically, we take that as a challenge and start asking questions to ourselves trying to figure out you know, why these why not these how and how.</i>

8.2.16. Affinity Diagramming

While affinity diagramming is not precisely a teaching strategy, it is a technique or a tool for gathering or consolidating insights (Blevis, 2021). As an activity, learners engage in mind mapping and create connections between ideas, based on their 'relatedness' (Smith, 1998). In this process, ideas are clustered, and themes start to crystallise (Grzelec, 2019), leading to further ideas. Getting the students to think about the relationships between ideas can be an excellent way to develop their ability to generate ideas by merging, contrasting, modifying and generally speaking working with existing ideas. Using such an activity systematically or at the right moment becomes a teaching strategy. Person 18 is using affinity diagramming in such a case. She lets students collect a vast amount of information, and at another moment later, she will encourage students to explore connections by physically moving ideas around and exploring possibilities.

Person 18 – Affinity Diagramming

I teach affinity diagram as a synthesis tool. Basically, I give them time. So, after a few weeks of data collection, they come to the classroom and they have each one side of the wall, each team, and then they start doing affinity diagramming. And then I go around and ask, okay, how did you connect this and this, like, why would you move it? Why wouldn't you move this, post it to there and see whether you have a new idea and stuff like that. We have that activity.

8.3 Findings of RQ3

The third research question is defined as:

*What **teaching strategies** are favourable for developing the **personality traits** that nurture the ability to generate ideas?*

Table 62 on page 200 displays the teaching strategies ordered by how many educators (percentage) use each strategy. The percentage regards how many educators from the total population (n=167) use a strategy. The higher the percentage, the more popular a teaching strategy is. The exact figure is not the important remark to be made, but the fact all these strategies are being used by the majority is. The least popular strategy is being used by about 4 every 5 educators (79%) and the most popular strategy being used by nearly 5 out 5 educators (97%). On average, the responders were using 6.32 teaching strategies (the maximum strategies they could choose was seven). Moreover, the fact that all these strategies are popular does not mean that they are equally effective or develop personality traits in the same way.

Table 63 on page 201 shows which personality traits educators believe are being developed by the given teaching strategies. Please note that all figures shown portray percentages, except the rows and columns marked as medians and population. Each teaching strategy's percentages for each personality trait do not refer to the total population (n=167) but the population using the relevant strategy.

8.3.1. Finding 1 – Popularity

Table 62. Teaching strategies usage by population

<i>Supporting Environment</i>	97.01%
<i>Critical Conversations</i>	96.41%
<i>Expanding Experiences</i>	93.41%
<i>Student Interest</i>	91.02%
<i>Empathy</i>	90.42%
<i>Real-life</i>	85.03%
<i>Questioning Authority</i>	79.64%

8.3.2. Finding 2 – Results

Table 63. Results of study 3

		Teaching Strategies							
		Questioning Authority	Expanding Experiences	Supporting Environment	Empathy	Student Interest	Critical Conversations	Real-life	
Percentage		79.64%	93.41%	97.01%	90.42%	91.02%	96.41%	85.03%	
Personality traits	Flexible	84.21	64.74	48.15	80.79	32.89	72.05	50.70	
	Able to think independently	93.98	53.85	64.81	35.76	71.05	78.26	54.93	
	Accommodating opposites	24.06	21.79	47.53	47.02	23.03	35.40	21.83	
	Adaptive	36.09	29.49	38.89	63.58	36.84	45.34	57.75	
	Aesthetic sensibility	23.31	55.13	12.35	19.87	34.87	33.54	26.06	
	Problem awareness	62.41	41.03	25.31	73.51	24.34	55.90	90.14	
	Synthesising	60.15	63.46	35.80	47.02	40.13	60.25	52.82	
	Imaginative	43.61	57.05	37.65	35.76	57.24	26.71	35.92	
	Seeing relationships	57.89	78.21	41.98	54.30	42.76	56.52	54.23	
	Highly curious	70.68	78.85	62.96	49.01	65.13	31.06	48.59	
	Playful	25.56	36.54	37.04	13.91	46.05	11.18	13.38	
	Fluent	38.35	58.33	49.38	35.10	55.92	42.86	33.10	
	Risk-taking	62.41	28.21	66.67	21.19	44.74	42.24	33.80	
	Metaphorical thinking	42.86	53.85	28.40	39.74	25.00	44.10	33.10	
	Willing to work hard	18.80	14.74	30.25	17.88	51.97	36.65	50.70	
	Median		44	54	39	40	43	43	49
	Average		50	49	42	42	43	45	44

A higher median figure on a teaching strategy can be interpreted as a strategy that overall educators perceive as developing many personality traits. A lower median could mean the opposite, that a strategy is developing a lower the mix of personality traits. As no value is below zero or near zero, it means all of the teaching strategies are believed to improve the fifteen personality traits to some extent. There are, however, noteworthy discrepancies. For example, INDEPENDENT THINKING is believed to be developed well with CRITICAL CONVERSATIONS and questioning authority, whereas EMPATHY does not seem to be so appropriate.

In this analysis, medians are being used as it deems to be a more appropriate metric than averages. Even though the average is a popular-used statistic that reflects an arithmetic mean, the median descriptors the data's median value. The arithmetic mean (average) may not reflect the central tendency among personality traits, as there could be outlier responses that alter the final figures. Nonetheless, interested readers can examine how the average and medians of the teaching strategies differ by viewing *Figure 17 on page 203*.

Regarding the differences between median and average, an example for illustrative purposes can be made with the area size of the 30 largest countries²⁸. The average size of the countries is 3,470,000 sq. km. Whereas the median size of the countries is 1,880,00 sq. km. There are very few extremely large countries (outliers), such as Russia, Canada, the USA, China and Brazil, which are resulting in a much larger average size. These five counties combined, are larger than the next 25 countries combined. This means 16 per cent of the sample is larger in area the rest 84 per cent of the sample. In this

²⁸ The dataset used for the example is by CIA. (April 7, 2021). The 30 largest countries in the world by total area (in square kilometers) [Graph]. In Statista. Retrieved January 05, 2022, from <https://www.statista.com/statistics/262955/largest-countries-in-the-world/>

case, the average size (arithmetic mean) is not a very good representative figure, whereas the median reflects better for reflecting a more representative middle value.

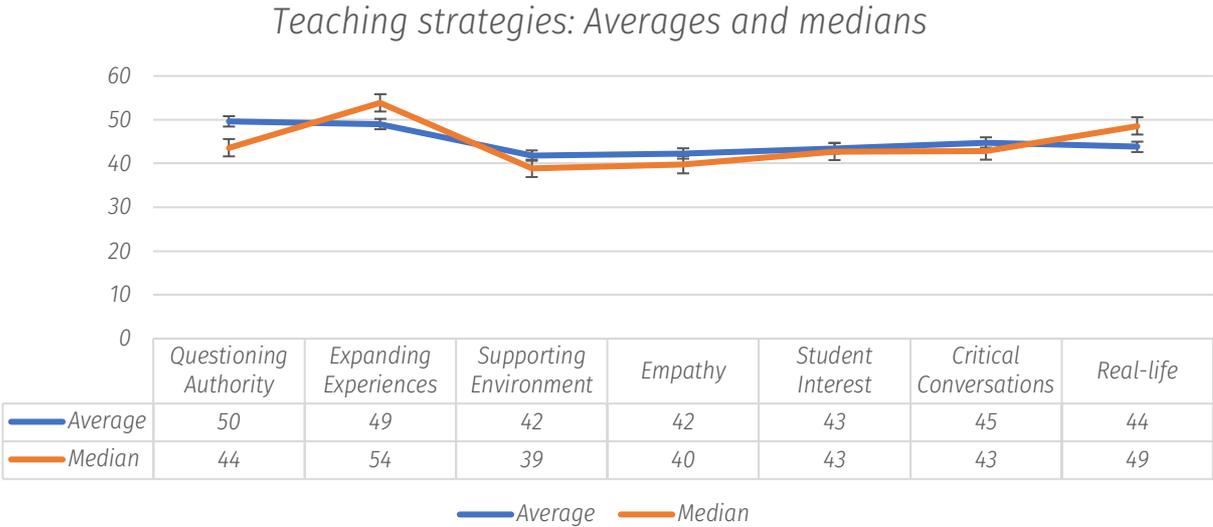


Figure 17. Averages and medians

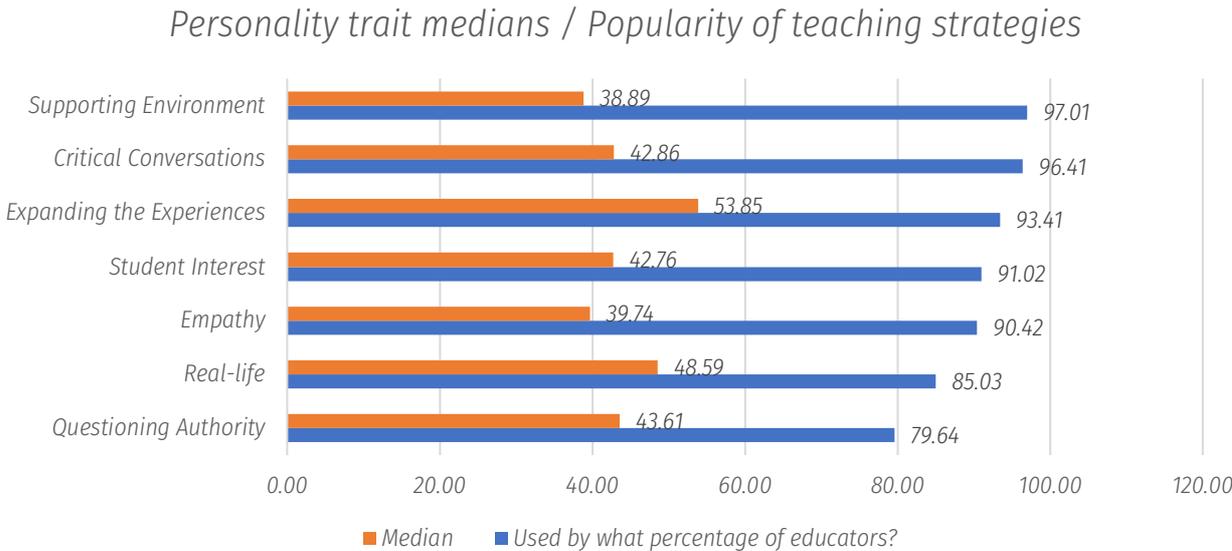


Figure 18. Personality trait medians and popularity of teaching strategies

8.3.3. Finding 3 – Expanding experiences

[The data shows that EXPANDING EXPERIENCES is a teaching strategy that design educators believe it develops the majority of the traits that influence the ability to generate ideas]

Table 64. Expanding experiences

	<i>Questioning Authority</i>	<i>Expanding Experiences</i>	<i>Supporting Environment</i>	<i>Empathy</i>	<i>Student Interest</i>	<i>Critical Conversations</i>	<i>Real-life</i>
<i>Percentage of population²⁹</i>	79.64%	93.41%	97.01%	90.42%	91.02%	96.41%	85.03%
<i>Median of the personality traits</i>	43.61	53.85	38.89	39.74	42.76	42.86	48.59

EXPANDING EXPERIENCES is the only teaching strategy that has a median above 50. It is a teaching strategy that can be regarded as developing most of the traits that influence the ability to generate ideas. Additionally, as it is being used by 93% of the responders, it is an overall teaching strategy. A median of 53.85 appears as the most suitable teaching strategy to be ‘EXPANDING EXPERIENCES’ of the seven strategies that this PhD investigates. The second most suitable has a median of 48.59 (5.25 lower than EXPANDING EXPERIENCES). This teaching strategy is ‘REAL-LIFE’.

Upon reflecting on the third research question, *What teaching strategies are favourable for developing the personality traits that nurture the ability to generate ideas*, EXPANDING EXPERIENCES would be the strategy that appears to have the most influence on developing personality traits. Nonetheless, it should be noted that this finding is based on the perceptions of educators. Follow up studies are recommended to verify (or challenge) this finding. In this

²⁹ Percentage of design educators who use the teaching strategy of each respective column.

dissertation, only seven teaching strategies were examined (identified by RQ2). EXPANDING EXPERIENCES appears to be effective for the growth of the ability to generate ideas from only these seven strategies.

8.3.4. Finding 4 – Supporting learning environment

[SUPPORTING LEARNING ENVIRONMENT is a prevalent teaching strategy used by 97% of design educators. However, the data indicates that educators do not believe it improves particularly well the ability to generate ideas]

Table 65. Supporting learning environment

	<i>Questioning Authority</i>	<i>Expanding Experiences</i>	<i>Supporting Environment</i>	<i>Empathy</i>	<i>Student Interest</i>	<i>Critical Conversations</i>	<i>Real-life</i>
<i>Percentage of population³⁰</i>	79.64%	93.41%	97.01%	90.42%	91.02%	96.41%	85.03%
<i>Median of the personality traits</i>	43.61	53.85	38.89	39.74	42.76	42.86	48.59

Among the seven teaching strategies, only 3% of educators do not utilise a supportive learning environment in their classes. That means practically nearly ten out of ten educators create environments where students are encouraged in various ways and means. Despite the prevalence of the strategy, of the seven strategies, SUPPORTING LEARNING ENVIRONMENT has the lowest median in the growth of the personality traits that influence the ability to generate ideas. It is the most popular teaching strategy by far, with 97 out of 100 educators using it. Also, with a median of 38.89, it appears to be the least suitable strategy of the seven strategies. Even though it is a prevalent teaching strategy, the figures indicate that they believe this strategy is not as effective as the others. Another teaching strategy, EMPATHY, also has a shallow median at 39.74, with a marginal difference of 0.85. You can read more about this strategy in the very next section.

³⁰ Percentage of design educators who use the teaching strategy of each respective column.

8.3.5. Finding 5 - Empathy

[Being EMPATHIC, it appears it does not improve the ability to generate ideas significantly]

Table 66. Empathy

	<i>Questioning Authority</i>	<i>Expanding Experiences</i>	<i>Supporting Environment</i>	<i>Empathy</i>	<i>Student Interest</i>	<i>Critical Conversations</i>	<i>Real-life</i>
<i>Population³¹</i>	79.64%	93.41%	97.01%	90.42%	91.02%	96.41%	85.03%
<i>Median of the personality traits</i>	43.61	53.85	38.89	39.74	42.76	42.86	48.59

Using EMPATHY as a teaching strategy and engaging students to adopt an empathetic perspective by understanding how users feel yielded a low median of 39.74. While empathy alone has recently gained momentum and popularity through design thinking literature, with such a low median figure, educators believe that utilising an empathic mindset in design education is not highly effective for improving ability to generate ideas.

³¹ Percentage of design educators who use the teaching strategy of each respective column.

8.3.6. Finding 6 – Questioning authority

[QUESTIONING AUTHORITY might be a solid teaching strategy to foster specific personality traits, such as INDEPENDENT THINKING ABILITY and FLEXIBLE. However, the data suggests it is not as popular as some other strategies.]

Table 67. Questioning authority

	<i>Questioning Authority</i>	<i>Expanding Experiences</i>	<i>Supporting Environment</i>	<i>Empathy</i>	<i>Student Interest</i>	<i>Critical Conversations</i>	<i>Real-life</i>
<i>Population³²</i>	79.64%	93.41%	97.01%	90.42%	91.02%	96.41%	85.03%
<i>Median of the personality traits</i>	43.61	53.85	38.89	39.74	42.76	42.86	48.59

QUESTIONING AUTHORITY is the least popular strategy of the seven strategies, with 79.64% of participants admitting to using the teaching strategy. While 79.64% is still a high number, all other strategies yielded bigger figures. The median for QUESTIONING AUTHORITY at 43.61 is slightly higher than 38.89 (the lowest recorded in this study). These figures indicate that the educator considers it somewhat average in fostering the ability to generate ideas. Notably, it has very high medians on specific personality traits among all strategies. The ABILITY TO THINK INDEPENDENTLY has the highest median in the entire dataset, at 93.98. FLEXIBLE is also very high at 84.21 (the third-highest median in the whole dataset). These median figures can be considered significant, being somewhat of outliers, indicating that educators believe this teaching strategy is very suitable for the growth of the two mentioned personality traits. Perhaps it can be expressed that the data suggests that educators are confident that QUESTIONING AUTHORITY grows the ability to think

³² Percentage of design educators who use the teaching strategy of each respective column.

INDEPENDENTLY and FLEXIBLE. Considering the lower popularity and the strengths of this teaching strategy, it can be said that it is possibly a teaching strategy that is not being used as much as it could have been.

Table 68. Traits affected by Questioning Authority

	Median
<i>Able to think independently</i>	93.98
<i>Flexible</i>	84.21
<i>Highly curious</i>	70.68
<i>Being aware of existing problems</i>	62.41
<i>Risk-taking</i>	62.41
<i>Synthesising</i>	60.15
<i>Seeing relationships</i>	57.89

9. Discussion

It is known that educators have to choose from a range of activities to bring into the learning environment and plan their delivery accordingly: think about the sequence of the activities and relate them to the learning outcomes (Cope & Kalantzis, 2016, p. 31). By repeatedly attending classrooms and workshops and being exposed to a range of such well-thought and properly curated teaching strategies, learners gain more advanced and competitive skills for the design industry (presumably after a lengthy design education that lasted a few years).

Arguably, education is not limited to developing skills, gaining knowledge and learning various techniques. It is about preparing learners for a lifelong learning attitude, helping respond to novel situations with imagination, ingenuity, and creativity (Frascara, 2020; Grimard, 2021). The following pages portray remarks deriving from conducting this research. They are original remarks supported by the research presented in the earlier chapters and supported by the literature. This section aims to contribute to a deepened understanding of the literature on how design education improves the ability to generate ideas.

9.1 On teaching strategies

Educators use structured methods to help students practise and develop various skills. Various student-centred approaches contribute to acquiring skills such as autonomy, working collaboratively, applying academic thinking, and other skills (Westwood, 2008, p. 27). Design educators nurture learners to deal with uncertainty, helping them to grow their confidence, and push forward their ideas (Tovey, 2015d, p. 117). There is excellent literature about creativity skills in the education context and even books with an explicit focus on this area, such as *Creativity in Education* (Craft et al., 2001) and *Creativity and Education* (Harris, 2016). However, as explained earlier (on page 7 and section 2.5 on page 11), not much literature describes the strategies that design educators deploy in their classrooms and workshops to invoke the relevant personality traits. Finding such information indicating the teaching strategies that invoke and foster these traits has not been fruitful.

Semi-structured interviews were deemed the most appropriate data collection method to fill this gap and obtain detailed descriptions of such teaching strategies. Following a carefully planned interview schedule (Table 57 on page 144) involved the sixteen most favourable traits from the first study. Even though thirty-six traits were found in literature, twenty traits were eliminated. The selected sixteen (which were the most favourable) are thought to be more impactful in generating ideas. However, this reduction does not mean that the twenty traits eliminated (the less favourable) are disregarded. The eliminated traits are essential and may contribute to a designer's growth in other ways that this dissertation does not examine further.

Twenty-four educators from multiple countries were interviewed. The interview schedule did not have any questions asking explicitly what the teaching strategies are. Instead, it entailed invoking a 'free-flow'³³ discussion

³³ Please note that free-flow discussion means following the semi-structure interview agenda and allowing interviewees to take their answer at any direction without any constraints (besides time).

based on a set of questions that allowed the interviewees to explain and give context on what they are doing in their classrooms and workshops to invoke the relevant personality traits. Also, it allowed the educators to provide actual examples from their real-world practice, giving much-needed context on how the previously mentioned traits relate to design education.

The interviewees elaborated on at least fifteen different teaching strategies³⁴ used by at least two or more individuals. This variety indicates that educators do a range of activities in their classes.

³⁴ The list of the fifteen teaching strategies is shown in [*Table 61 on page 225*](#).

9.1.1. Hybrid teaching strategies

Sixteen teaching strategies were found in the second study. Some strategies may appear to be similar to each other. For instance, FRAMEWORK and TOOLBOX may appear similar or QUESTIONING AUTHORITY which shares commonalities with CRITICAL CONVERSATIONS (both of which are explained in more detail below). These similarities create a fluidity among the various teaching strategies, which means two or more strategies can be incorporated in a single lesson, resulting in 'hybrid' strategies.

Understandably, hybrid strategies do occur in design education, considering the design domain has at least five signature pedagogies identified by Shreeve (2016): the studio, projects and the brief, materiality, dialogue and the critique. These signature pedagogies are explained on page 48. As design education develops a multitude of skills and the ability to generate ideas is only one of these skills, it is explicable that teaching strategies develop numerous personality traits in one way or another.

Section 6.2 on page 82 provides a comprehensive list of thirty-six personality traits, and Table 9 on page 83 provides a set of definitions for each personality characteristic. More lists are presented in the appendix (Table 81 on page 323, Table 82 on page 324 and Table 83 on page 325). It is highly plausible that design education develops many items in these lists, if not all of them. One of the ways to develop such a range is by deploying hybrid teaching strategies.

Nonetheless, the teaching strategies identified in this thesis were detected by examining activities used to improve the students' ability to generate ideas. The teaching strategies in this thesis are only a small selection of all the things that educators do. This selection was derived from a small interviewee sample.

While there may be many more teaching strategies fostering the ability to generate ideas, the seven most frequently mentioned teaching strategies were explored further in the third study. An attempt was made to detect the personality traits that educators believe are being affected by conducting a survey. The data clearly indicates that no strategy is the same or has the same performance.

Learners learn differently, and learning changes from person to person. Depending on the changes that come with each cohort year by year, the same strategy can produce drastically different results. As shown by the findings from the third study, each strategy affects personality traits differently. (*Table 63 on page 201*). This is valuable for educators, as having various teaching strategies can make design education a varied, perhaps enjoyable, not dull experience. Instructors can become empowered with this knowledge and modify their teaching strategies accordingly.

Similarities and differences

Three similar teaching strategies overlap to some extent. To clear any confusion, it is worthwhile explaining how these differ. The strategies are TOOLBOX, FRAMEWORKS, and AFFINITY DIAGRAMMING. The TOOLBOX strategy entails showcasing many idea generation techniques (can also be thought of as tools) and testing them out. Many idea generation techniques exist, such as brainstorming, brainwriting, crazy eights, 6-3-5, TRIZ, morphological analysis, and so on. There are more than a hundred tools and techniques. Many are documented through the life work of Arthur VanGundy (1946-2009). Brainstorming, the widely popular technique, is just one of the available techniques one can choose from. The teaching strategy TOOLBOX is about introducing learners to such techniques, hence building a 'toolbox' that can be used later whenever necessary. This can become incredibly useful once the learners have landed in the industry.

The FRAMEWORK has similarities with TOOLBOX, but they are still both different. While the toolbox is a teaching strategy about highlighting various techniques to generate ideas, the FRAMEWORK introduces new ways of thinking that can help learners generate ideas differently. Many of these techniques, such as morphological analysis or solution mapping (Lee et al., 2021), can also be considered frameworks since they set the stage for ideational thinking. Providing learners with various techniques is TOOLBOX while introducing one technique that makes students think in a way they never did before, is FRAMEWORK. For instance, various forms of brainstorming, such as brainwriting, fatigue storming, or reverse brainstorming. Each one of these can be regarded as a technique. Introducing students to a range of such techniques is TOOLBOX. On the other hand, teaching learners 'to think' in ways they did not know before using a technique new to them -such as brainstorming- is FRAMEWORK.

Finally, another teaching strategy mentioned earlier is AFFINITY DIAGRAMMING. AFFINITY DIAGRAMMING or more commonly known as mind-mapping, is simply a popular idea generation tool. It is widespread not only in the design world but

also in the business and entrepreneurship realm. It can be just one of the tools being taught as part of the TOOLBOX strategy. However, some of the interviewed educators use this technique as the foundational basis where their class revolves around it. As such, I regard it as a teaching strategy in its own right.

9.1.2. Critical conversations

CRITICAL CONVERSATIONS is a teaching strategy that is encouraging students to engage in a dialogic debate. It is a major characteristic in design education, being used in formative and summative assessments, and in feedback sessions as well (Gray, 2019). This instructional method (sometimes called the Socratic method) is about constructing a series of arguments followed by open questions to be answered by learners. The educators or the learners' peers who may be participants in the friendly debate will be challenged by these answers. Through this technique, constructive criticism helps learners reframe the problem and re-examine both problem and solution.

This teaching strategy is directly related to two signature pedagogies for designers, the critique and the dialogue (introduced earlier *on page 48*). The critique is one of the significant ways that learners develop the skill to respond to project briefs. It is beneficial for establishing ways of thinking and evaluating appropriateness in design (Shreeve, 2016; Yorgancioğlu, 2020). Engaging in critique and reframing problems is also particularly helpful in encouraging a diverse output (Hokanson & Kenny, 2020). Through dialogue, a social process involving others, designers will have to become skilled negotiators (Dorst, 2007a). When this strategy is deployed consistently across a three or four-year design program, learners achieve a higher ability to support their work with valid arguments.

It is a prevalent strategy as 96.41% of responders use it in their classrooms (meaning more than nine out of ten people). 78.26% of educators believe it encourages INDEPENDENT OF THOUGHT and 72.05% believe it affects FLEXIBLE. These two personality traits alone appear to be from the most significant traits impacting the ability to generate ideas (shown in the findings section, in *Table 60 on page 163*).

9.1.3. Empathy

EMPATHY is another popular teaching strategy, with 90.42% of participants using bring it in their classrooms. Empathy is considered a pillar in design and has become even more popularised recently due to its relevance with design thinking, being one of its core qualities (Brown, 2008). The prestigious Delft program in Industrial Design Engineering includes it at the very core at one of the design competencies in their curriculum renewal (Voute, Stappers, Giaccardi, Mooij, & van Boeijen, 2020). Empathy entails engaging and promoting an empathetic perspective to design learners and encouraging them to understand how a user or an audience may feel and gain a deeper insight into the motivation behind user behaviour. Empathy is one of the skills that make a person into a designer³⁵ (Porten, 2008) .

Sometimes referred as empathic design, empathy helps designers highlight the circumstances of users which results to good design outcomes (Chang-Arana et al., 2020). It may appear as similar to ethnographic research, however the roots are distinctly different. Empathic design is interpretive and is rooted in design practice whereas ethnography is focused in human activities which are then converted into inspiration (Mattelmäki, Vaajakallio, & Koskinen, 2014). The very specific aspect of interpretation is what makes empathy important in design. Design after all, is most often done for humans.

Moreover, this teaching strategy has a low median figure. At 40, it is the second-lowest among all the seven strategies. It shows that educators do not particularly believe this strategy significantly affects the personality traits associated with the ability to generate ideas. This is a significant finding, as this can indicate that using empathy tools, such as personas, empathy maps,

³⁵ Porten points out that there are many skills that make a person into a designer, such as keen observation, communicating ideas effectively, diplomacy and other skills (2008).

emotional journeys or any other empathy-focused tool, may not necessarily foster the ability to generate ideas.

Empathise is sometimes considered the first step in the design process. Some other times coming ideas with ideas might be considered the first step, depending the project. Regardless might be the first step, empathy does not seem to be as effective to foster the ability to generate ideas, when comparing to some other strategies. SUPPORTIVE ENVIRONMENT (discussed in section [9.1.5 on page 221](#)) and EMPATHY appear to be a prevalent strategies that are not particularly effective for the purpose of idea generation.

Furthermore, FLEXIBLE is the trait that empathy is believed to develop best (among the fifteen traits educators had to choose from). 80.79% of responders who use empathy believe that contributes to FLEXIBLE. Educators, when they ask learners to address someone's problem (for the sake of illustration, that someone is Mary), can consider guiding questions such as:

- What are the feelings of the person?
- What actions show these feelings?
- Can you identify these feelings through words?
- How to describe these feelings?

With such questions, students can reflect on identifying the problem while understanding how Mary feels (Alrubail, 2015). In a way, this teaching strategy allows learners to step in another person's shoes and enlarge one's perspective, becoming more tolerant of different worldviews and accommodating a more flexible and adaptive attitude. Speaking of adaptive attitude, ADAPTIVE is another where 63.58% of educators believe it is being developed through empathy. Even though empathy does not appear to be one of the effective teaching strategies contributing to the ability to generate ideas, it is still a particularly useful strategy. It is associated with FLEXIBLE, it contributes to one of the critical personality traits needed in ideation.

9.1.4. Real-life

REAL-LIFE is a slightly less popular teaching strategy (compared to the seven examined), as only two strategies are used by less than 90% of the educators, and REAL-LIFE is one of them. According to the data, 85.03% use this strategy, making it the second least popular (the least popular is QUESTIONING AUTHORITY used by 79.64%). Nonetheless it should not be considered unpopular, as more than eight out of ten educators use this teaching strategy. It is quite often that instructional activities and assignments focus on ill-defined, real-world problems (Huffman & Zrada, 2021).

With a median at 49 has been the second-best³⁶ which indicates that it may be an appropriate method to foster the ability to generate ideas. It is about using real-world problems in the design classroom and relating the design practice to the larger picture as a strategy. This can be done using real-world case studies, which rich provide insights grounded in real life and real complex situations, built into design briefs (Tovey, 2015b, p. 12). The design briefs are also one of Shreeve's five signature pedagogies (2016) and explained in on page 48.

Working with real-world problems encourages learners to expand their understanding of the world beyond their own worldview. Designers are expected to be working with such issues and offer inclusive solutions. According to the data from the third study, 90.14% of educators who use this teaching strategy believe it develops PROBLEM AWARENESS. This is an exceptionally high percentage regarding personality traits, also the second-highest in the study³⁶. However, it is noteworthy that the rest of the personality traits have had significantly lower percentages. The immediately next percentage is ADAPTIVE at 57.75%. Therefore, the data suggest that real life is strongly associated with PROBLEM AWARENESS.

³⁶ second highest based on the dataset from the third study, shown in Table 63 on page 241.

9.1.5. Supporting environment

SUPPORTING ENVIRONMENT has been the most popular teaching strategy used by 97.01% of responders. It is the most widespread instructional method from all seven teaching strategies. However, upon looking at its effect on personality traits, it has the lowest median, at 39. This stark contrast of high popularity with low median may mean that educators are conflicting with themselves. On the one hand, nearly all educators use this teaching strategy. On the other hand, they do not believe it is as effective as the other strategies.

The environment is a significant component of constructivist teaching approaches (Schunk, 2020, p. 317) and is directly related to the 'studio' teaching pedagogy identified by Shreeve (2016) (explained *on page 48*). The studio is a workplace (physical or virtual) where discussions and conversations occur. It is an environment where individuals learn how to act, behave and think according to the appropriateness of the situation (Gray, 2013). Additionally, Ozuah has pointed out that adult learners learn best in a safe, non-threatening environment (2005). Nonetheless, as the data suggests, despite being a popular teaching strategy that has a significant contribution to becoming a designer, it appears educators do not believe to be as effective for the ability to generate ideas.

It should be noted that this strategy (and the others too) is not being used in isolation and is expected to provide multiple benefits that expand beyond the ability to generate ideas. Possibly this strategy contributes to other traits not studied in this dissertation, perhaps confidence. From the traits that were studied in this thesis, there are only three where the majority of educators believe that the SUPPORTIVE ENVIRONMENT invokes them. These traits are the ABILITY TO THINK INDEPENDENTLY (64.81%), RISK-TAKING (66.67%), and HIGHLY CURIOUS (62.96%).

9.1.6. Expanding experiences

EXPANDING EXPERIENCES is the teaching strategy with the highest median, indicating that educators believe it is the most effective (from the seven strategies) to develop the ability to generate ideas. EXPANDING EXPERIENCES is crucial in the constructivist learning paradigm as it acknowledges that learners from different cultural contexts can construct different meanings from the same experiences (Hutchison, 2006). Individuals are expected to adapt to their subjective experiences and construct their knowledge (Sharma et al., 2005). In this paradigm, knowledge is considered local, and reality encompasses individual experiences (Rossman et al., 2010, p. 508).

Therefore, providing opportunities to gain new experiences, construct their knowledge and form their own reality becomes paramount. Besides experiences, instructors ought to expose learners to real-world design projects, to strengthen their training (Zhu, 2021). Showing how numerous design experts do their work and how they do their in thinking, can make students examine other peoples' creative thinking process and develop their own (Hargrove, 2012).

According to the data, it is a strategy that develops multiple personality traits, the two most prominent being SEEING RELATIONSHIPS (78.21%) and HIGHLY CURIOUS. (78.85%). These two personality traits have also been the two more popular in the first study. They were selected by more than half of the participants (n=104) in the first study selected these two alone from an extensive list with thirty-six factors. Please note that participants were limited to selecting only five traits (the full results from the first study are as shown in *Table 60 on page 163*).

If readers were to select only one strategy from this dissertation to develop the ability to generate ideas, this strategy would be the one. As an instructional method, it encourages students to explore the world and collect a wide range

of experiences. In one of the interviews that I conducted, an educator emphasised the importance of sending wealthy and affluent learners to take the bus and visit the downtown area of the city where there are different types of people from a range of different social classes (different than the social class of the learners). It may appear as a simplistic teaching method: take the bus and get to town. However, according to the educator who offered this anecdote, the learners, upon their return, have improved their ability to generate ideas.

Design schools are not strictly 'traditional' schools where the teacher is unquestionable, and students practice rote learning. Instead, design schools encourage students to get involved with a vast range of experiences that may not appear very educational to non-designers. For example, playing video games, watching movies or YouTube, taking a stroll in a city, using a lousy umbrella during a rainstorm, or like the example mentioned above, even taking the bus can be part of design education. When planned and curated in the design classroom context, these activities can contribute mainly to idea generation.

As a strategy, expanding experiences is versatile and flexible. There are no well-defined limitations on what students cannot experience, other than not breaching university rules or doing something unethical. Perhaps this versatility can explain why this single strategy is believed to influence such a large variety of personality traits.

9.1.7. Questioning authority

QUESTIONING AUTHORITY is a technique that has been omnipresent throughout design education: often encouraged to question the brief, re-examine, and re-define the given problem, or even debate and argue with the instructors. Learners arrive at the design school with huge self-esteem because of a childhood filled in with positive reinforcement, possibly making design instructors from the first people to offer harsh criticism (Falcão, 2020). Through such a situation, students are expected to 'fight back' and defend their design choices, effectively questioning the authority - in this case the instructor, later the client.

Presumably, this is a strategy that is popular in many design schools and it is not being taught or delivered through a specific class or module. Perhaps there are some similarities with critical conversations (discussed earlier in section [9.1.2 on page 217](#)). Also, there a signature pedagogy identified by Shreeve titled 'dialogue' (2016). It was explained earlier in [on page 48](#). It entails interacting and questioning the project brief, and problematising around it develops into a dialogue with the instructor or the client (Tovey, 2015a). In my experience, questioning the obvious and making students persevere through (seemingly) impossible assignments were standard instructions when I was a student at design schools.

However, despite it is the least popular strategy (from all seven strategies), with 79.64% of educators using it. Despite being the lowest figure among all seven strategies, 79.64% is not a low figure, which means this strategy is quite common. Approximately four out five of the responders are indeed using it. Moreover, compared with the other strategies, it appears the least popular, which may be noteworthy for some readers.

It is also noteworthy that 93.98% of the educators who use this strategy believe it develops ABILITY TO THINK INDEPENDENTLY. Incidentally, this is also the highest

percentage of all traits and strategies from the third study (complete data shown in *Table 63 on page 201*). Also, FLEXIBLE (84.21%) and HIGHLY CURIOUS (70.68%) are two other traits that appear to be developed by this strategy. These three traits are believed from the most important influencing the ability to generate ideas, considering that they ranked pretty high in the first study *Table 60 on page 163*).

QUESTIONING AUTHORITY is a sound instructional technique that can be scaffolded by introducing small questioning exercises that invoke imagination and gradually escalate the amount of independence or authority that the students have. A popular exercise by IDEO is an excellent way to introduce questioning authority: the exercise “how might we” (IDEO, n.d.). This technique relies on modifying insights from the problem brief or problem research and transforming them into opportunities. It is done by rephrasing the insights in the form of questions that start with “how might we”. This exercise does not question authority's authoritative aspect, but it does get designers to question the problem instead of accepting it as an unmovable, inflexible given. This exercise can evolve as learners gain confidence and be ready to ask more challenging questions, such as “how might we address a better problem”.

9.1.8. Student interest

STUDENT INTEREST is a teaching strategy that encourages learners to use their own interest and pursue projects according to their liking. For example, a learner may be excited about a music band. This teaching strategy involves feeding into this personal excitement and producing work that is inspired in this context. It is an encouraging way to help learners to grow and bring their passion into their learning experience. One of the fascinating anecdotes that emerged through the interviews is that one of the educators encourages students to become more adventurous by providing them with a scale of 'adventureness'. When the students step out of their comfort zone and go beyond, the educator rewards them with additional credit or grades. It is an inspiring way to promote curiosity and risk-taking to those willing to pursue unique and new experiences.

According to Ozuah, learners learn best when there is a genuine desire to learn (2005), and this teaching strategy can contribute significantly to the effectiveness of learning. If learners are allowed to bring in their passion, their overall design performance shall increase. However, even though this strategy appears to be one of the most popular, being used by 91.02% of educators, the overall median is relatively low, at 43, just slightly higher than the lowest median of all strategies (SUPPORTING ENVIRONMENT with a median of 39). The low median perhaps indicates that educators believe this strategy is not particularly influencing the ability to generate ideas compared with the other strategies. Nonetheless, 71.05% believe that it contributes to INDEPENDENT THINKING, which was identified in the first study as one of the most important traits affecting the ability to generate ideas (view the results at [*Table 60 on page 163*](#))

9.1.9. Less popular teaching strategies

This PhD thesis focuses on seven teaching strategies, even though initially sixteen strategies were detected through the second study (more information on all strategies in section [8.2 on page 164](#)). This section pays closer attention to these remaining nine teaching strategies. The fact that these were not examined does not mean they are not essential or relevant. Based on the sample in the second study, the strategies emerged with a given frequency. If the sample were to change and the same interview protocol was followed, the frequency (and even the strategies) would likely change.

These strategies are WORKBOOK, TOOLBOX, AUTONOMOUS, FRUSTRATE ON PURPOSE, FRAMEWORK, LEAD BY EXAMPLE, VERBALISING, TEAM MEMBER and AFFINITY DIAGRAMMING. While this section does not detail each of these, it emphasises their equal importance with the seven strategies examined further in the third study. Multiple signature pedagogies can be associated with these strategies. For example, WORKBOOK, TOOLBOX, FRAMEWORK and AFFINITY DIAGRAMMING have to do with the signature pedagogy of materiality. All these strategies lead designers in producing something. Whether intangible (e.g. a half-baked idea) or tangible (e.g. a sketched out idea), these strategies lead to the production of design artefacts.

Similarly, VERBALISING is typical in the dialogue signature pedagogy, as the dialogue is a significant component in both design studies and the design industry. Regardless of written or oral speech, communicating through the medium of dialogue is extremely commonplace. This also relates to the teaching strategy of TEAM MEMBER, which involves simply teaming up with instructors and abolish the teacher-student relationship. Instead, adopt a colleague-to-colleague relationship, and treat students like professionals. It is typically done through dialogue as well.

9.2 On fostering the ability to generate ideas

The academic and non-fiction literature provide multiple options with many comprehensive lists of creative people's personality traits. Not many are focused on the specific traits that affect the growth of creative skills. Additionally, no list explicitly addresses the traits that affect the ability to generate ideas to my knowledge. At least, through my vigorous and extensive literature review, I could not find any.

A document titled 'assessing creativity' has been the primary source of the data used to answer the first research question (phrased at the beginning of this section). This document had multiple personality traits, which I compiled on an extensive list, totalling thirty-six personality traits. This list (with thirty-six options) was given to educators who were asked to specify which 5 of these 36 traits are the most important in influencing the ability to generate ideas. In total, one hundred four educators from the world's best design schools (as specified by the 2019 QS World Rankings) participated, and their vote produced a ranking shown on *Table 60 on page 163*.

9.2.1. Playful

PLAYFUL appears to be one of the most challenging traits to develop, at least with the seven teaching strategies discussed in this dissertation. There have not been many educators believing that any of the seven teaching strategies can develop PLAYFUL. The highest percentage is the student interest teaching strategy, which is reasonably low at 46.05%, followed by SUPPORTING ENVIRONMENT at 37.04% and EXPANDING EXPERIENCES 36.54%. The rest of the teaching strategies have significantly lower percentages, indicating that educators do not believe this trait can be developed. The seven teaching strategies that this dissertation has been examining. It is somewhat surprising that not many educators consider SUPPORTING THE ENVIRONMENT to be developing PLAYFUL. PLAYFUL happens in an encouraging environment, and it involves exploration too.

It is also worthwhile to mention that it appears PLAYFUL might be a contested trait between the east and the west. The debate may lie upon culture. However, more data is needed to verify whether this is true and improve validity and reliability. The interviews emerged one educator from Europe claiming that PLAYFUL is critically essential and part of the human experience. The educator considers them so necessary to send her kids to the hospital if they were not playful.

In contrast, another educator in Asia has said that PLAYFUL is irrelevant, and she does not see it as appropriate or related to creativity. It is perhaps a different approach to creativity, as both regions and worldviews, both Asia and the west, do have creativity. Creativity is part of human nature, and everyone has it to some extent.

9.2.2. Lack of creativity oversight

Through the semi-structured interviews conducted for the second study, two significant findings appeared.

- a) Most educators claim that creativity and idea generation are embedded throughout the curriculum. Except for the case of one educator (out of 24), there is no course about fostering creativity or explicitly teaching idea generation tools. Instead, there may be sporadic classes or workshops embedded throughout the various courses that comprise an entire undergraduate program.
- b) Additionally, some educators pointed out that there is no single person, university staff or colleague who oversees the ability to generate ideas throughout the program. That means no one checks whether students are creatively challenged enough or appropriately, holistically, and systematically from the beginning of the degree to the end.

These two findings are significant because they demonstrate a lack of oversight (or attention) regarding monitoring students' creative growth. Perhaps it also shows that no one ensures that creativity is delivered systematically through a well-planned and curated three or four-year program with an appropriately relevant course syllabus. Even though creativity is considered a core skill of designers and is also considered an essential skill needed even more in the future (Beckford, 2020; World Economic Forum, 2016, 2020). Through the semi-structured interview data, it may appear that not enough attention is being paid throughout undergraduate programs regarding the student's creative ability growth. Instead, it is primarily left in the hands of individual modules or courses and relies on the teaching style of whoever happens to teach. On the one hand, educators may have freedom, but on the other hand, the growth of creativity may appear as coincidental and not carefully planned throughout.

There is only one notable exception. One educator mentioned that one of the first courses in an industrial design program introduces students to creativity and idea generation techniques. This curriculum helps students kick off their creative skills and sets the foundation for the following courses. Another educator mentioned that the incoming students who just registered and are just starting their design studies, upon questioning, consider themselves very creative. When being challenged, they do discover that their creative ability is limited. It is a very insightful moment, where students discover that they can go beyond the boundaries of what they have been previously taught (perhaps at their high school where creativity might have been limited).

9.3 On personality traits

One crucial remark that I have to make is that personality traits are hard to measure. It can be challenging to evaluate and give a figure, for example, how much curiosity someone has or how imaginative a learner is. It is very likely that people's performance varies and depends on many things, including external factors. For example, a sunny day may make people happier than a rainy day. This happiness, by extension, can contribute to their willingness to be curious or imaginative. Understandably, experienced educators could form an opinion and consider that student A has more curiosity than student B; however, such evaluation will be based on empirical knowledge and a generalised opinion, which is impossible to be wholly impartial or bias-free.

It may be tempting to disregard some traits that ranked low in this dissertation and consider them insignificant. However, the figures shown in this manuscript do not represent significance are not a measurement of some kind. These figures simply represent a tendency based on the perceptions of educators³⁷. For instance, even though no one selected ELABORATION, it an essential trait for all designers, especially when they have to showcase their work to clients or the people they have to report to.

³⁷ Perhaps the measurement that these figures represent is the tendency of the perceptions of the educators.

9.3.1. Development of traits by a wide range of techniques

Two personality traits are being developed very well through a wide range of techniques. This is based on the percentage of educators who believe the relevant teaching strategies can develop these traits. According to the data from the first study, these two traits are FLEXIBLE and HIGHLY CURIOUS, both of which are among the most important in developing the ability to generate ideas, according to the data from the first study (full results of the first study shown in *Table 60 on page 163*).

Table 69. Traits developed well by a range of techniques (50%>)

		Teaching Strategies						
		Questioning Authority	Expanding Experiences	Supporting Environment	Empathy	Student Interest	Critical Conversations	Real-life
Percentage		79.64%	93.41%	97.01%	90.42%	91.02%	96.41%	85.03%
Personality traits	Flexible	84.21	64.74	48.15	80.79	32.89	72.05	50.70
	Able to think independently	93.98	53.85	64.81	35.76	71.05	78.26	54.93
	Accommodating opposites	24.06	21.79	47.53	47.02	23.03	35.40	21.83
	Adaptive	36.09	29.49	38.89	63.58	36.84	45.34	57.75
	Aesthetic sensibility	23.31	55.13	12.35	19.87	34.87	33.54	26.06
	Problem awareness	62.41	41.03	25.31	73.51	24.34	55.90	90.14
	Synthesising	60.15	63.46	35.80	47.02	40.13	60.25	52.82
	Imaginative	43.61	57.05	37.65	35.76	57.24	26.71	35.92
	Seeing relationships	57.89	78.21	41.98	54.30	42.76	56.52	54.23
	Highly curious	70.68	78.85	62.96	49.01	65.13	31.06	48.59
	Playful	25.56	36.54	37.04	13.91	46.05	11.18	13.38
	Fluent	38.35	58.33	49.38	35.10	55.92	42.86	33.10
	Risk-taking	62.41	28.21	66.67	21.19	44.74	42.24	33.80
	Metaphorical thinking	42.86	53.85	28.40	39.74	25.00	44.10	33.10
	Willing to work hard	18.80	14.74	30.25	17.88	51.97	36.65	50.70
	Median	44	54	39	40	43	43	49
Average	50	49	42	42	43	45	44	

Besides the two traits mentioned earlier in this section, other traits can be cultivated with various teaching strategies. For example, SYNTHESISING and SEEING RELATIONSHIPS can be fostered by various means. While there is nothing particularly special (or new) by acknowledging that personality traits can be cultivated in more than one way, the fact that there are various teaching strategies that can affect a specific set of personality traits is significant.

In an earlier discussion (section [9.1.1 on page 213](#)), the concept of hybrid teaching strategies³⁸ was explored. For instance, the combination of REAL-LIFE and EMPATHY appears to have a high impact on PROBLEM AWARENESS. Another example can be the EXPANDING EXPERIENCES brought together with QUESTIONING AUTHORITY. Both of these seem to have a very high impact on HIGHLY CURIOUS. Presumably, when these two teaching strategies are brought together in a class, HIGHLY CURIOUS is perhaps fostered even further, possibly due to a ripple effect.

It is unreasonable to argue that one-size-fits-all or assumes that these teaching strategies can affect the figures identified in the third study. Even though the data is valid and reliable, and the sample size (n=167) is not small, a different sample may produce different results. Nonetheless, the findings that are presented here are valuable in presenting tendencies. For instance, in a classroom where QUESTIONING AUTHORITY and SUPPORTING ENVIRONMENT are present, it is likely (according to the data) to impact HIGHLY CURIOUS positively. Even though it may sound trivial, it is an essential contribution as this information can now be considered evidence-based and supported with data.

³⁸ teaching strategies that incorporate more than one strategy

9.3.2. Traits that are not believed to impact idea generation

It has been unexpected (to me) that there are four traits that none of the responders selected in the first study. The traits of NOT AFRAID OF THE UNKNOWN, WORK INDEPENDENTLY TO FINISH A PROJECT, ELABORATIVE and ANALYTICAL SKILLS. Additionally, five more traits were selected by less than 5% of the participants. These are SEEING THEMSELVES AS CREATIVE, UNWILLING TO ACCEPT AUTHORITY, LACK OF INHIBITION IN EXPRESSING AN OPINION, REORGANISING and the RECLUSIVE. *Table 70 below*, displays the exact percentage of educators who chose these traits.

Table 70. Traits that are not believed to impact idea generation

Personality trait	%
<i>Perceive the self as creative</i>	4.81
<i>Questioning authority</i>	4.81
<i>Uninhibited in expressing an opinion</i>	3.85
<i>Reorganizing or redefining</i>	3.85
<i>Reclusive</i>	3.85
<i>Open to experience and ideas</i>	0
<i>Self-disciplined</i>	0
<i>Elaborative</i>	0
<i>Analysing</i>	0

Perhaps one explanation might be that these traits needed after ideas are generated but are not needed to produce ideas. Another possible explanation could be that many of these nine traits characterise a peculiar, perhaps eccentric personality. Famous eccentric creative individuals, such as Michelangelo, Salvador Dali and Vincent Van Gogh, have had personalities that possess such characteristics. All these individuals have been considered social outcasts or controversial during their time.

Every design school would aspire to produce such creative geniuses if it was possible. However, such eccentric creative people would have been

complicated or challenging people to work with, as students or on a personal, human to human level. Education involves a social component that has not been examined in this dissertation. That may be one reason that can perhaps explain why all these personality traits have ranked particularly low. Considering the survey participants are design educators, their responses may indicate traits that they have witnessed in their students, based on their experience.

Many design students (if not all) eventually become better at idea generation through design school. The design school provides the circumstances and conditions to improve traits affecting the ability to generate ideas. Educators are mainly responsible for creating these conditions in the school context. The lowest ranking conditions are perhaps more challenging or tricky to encourage and foster through classes and workshops. As such, it is a possibility that these traits are not preferred by the educators, resulting in such low figures.

9.4 On the importance of teaching strategies

This PhD thesis has focused on how design educators improve the students' ability to generate ideas. Generating ideas is not an explicit phenomenon that only occurs at the design school. Anyone can generate ideas in one way or another. This ability can be considered inborn. It belongs instinctively to the human experience. Humans have been generating ideas for thousands of years since the early beginning as part of the effort to survive. In the context of survival, generating ideas is a crucial mechanism contributing to survival and wellbeing. It is more about figuring out the world and our role in it and less about producing what would be described today as creative ideas.

Even though humans certainly do today generate ideas for their survival, countless centuries of gradual progression and technological advancements have made survival easier. The circumstances that required early humans to generate ideas are very different compared to today's. Creativity and being creative are current themes, discussed extensively in the literature and the media. Various sources claim creativity or skills related to creativity will be even more critical soon in the times ahead (Beckford, 2020; World Economic Forum, 2016, 2020).

A question is where design education and design schools fit in all this. Designers are professionals who give shape to things and largely contribute to how humans experience the world. For example, driving one car can be a completely different experience from another car, even on the same route, at the same time/season, even if the cars were similarly priced models from different brands. The difference lies in the genuine experience of what makes each vehicle uniquely different. Such differences are primarily due to the work of designers. Designers ought to come up with fabulous, novel ideas that differentiate and improve the driving experience. The ability to generate ideas of designers becomes an essential ability or skill that will contribute to creating a unique experience.

Designers, the recipients of design education, are considered creative individuals who generate novel ideas and responding to new, unseen or unheard of problems. Design schools are considered places where designers are nurtured and grow their skills. A designer's ability to generate ideas, in principle, is perceived to be better than other professions that are thought to be less creative³⁹. A design school is a place (or institution) that designers go through to become more competent, develop their skills and leave school as more competitive employees in a tough labour market. Design schools, among others, do foster creative ability, including idea generation, by deploying various means. This dissertation has been explicitly examining the teaching strategies (as described by design educators) that contribute to the growth of the ability to generate ideas.

Through a series of data collection points and studies conducted for this PhD, some conclusive findings were identified. This PhD dissertation, while primarily qualitative, it follows a mixed methods research structure. Three separate studies were conducted, each one contributing sequentially to the following study that followed. The studies also follow a chronological order. The 1st study was a survey (n=104). The 2nd study was a series of semi-structured interviews (n=24), and the 3rd study was another survey (n=166). Please note that the sudden use of past tense in this paragraph only indicates that the studies were conducted. Now they are completed, which by no means indicates that the subject matter being studied is finished. It only means that the three studies of this dissertation are finished. The completed studies set the foundation and groundwork for further future studies, as explained *on page 241*. As shown in *Figure 15 on page 131*, the thesis is using a mixed methods methodology.

³⁹ All professions, regardless of their nature, can require creativity, and in that sense that no 'creative' and 'non-creative' professions. Nonetheless, design is an industry that by it's nature require creativity.

9.5 Discussion Summary

A summary of the topics discussed in this chapter, is provided on the table below.

Table 71. Summary of the Discussion Chapter

Section	Topic discussed
9.1.1 Hybrid teaching strategies	Teaching strategies do not exist in isolation. They merge and overlap with other strategies, creating pedagogies that incorporate multiple pedagogies.
9.1.2 Critical conversations	CRITICAL CONVERSATIONS is a teaching strategy that encourages students to engage in a dialogic debate, and it appears to be encouraging INDEPENDENCE OF THOUGHT and FLEXIBLE traits.
9.1.3 Empathy	EMPATHY is a popular teaching strategy. However, it does not appear to foster the ability to generate ideas as well as some other strategies.
9.1.4 Real-life	REAL-LIFE is slightly less popular than the examined teaching strategies. Moreover, it appears as an overall good strategy for a range of traits that impact the ability to generate ideas.
9.1.5 Supporting environment	SUPPORTING ENVIRONMENT is the most popular strategy. However, it is the least impactful on average on a range of personality traits that impact the ability to generate ideas.
9.1.6 Expanding experiences	EXPANDING EXPERIENCES is a popular strategy, which seems to have a good impact (on average) on a range of personality traits that influence the ability to generate ideas.
9.1.7 Questioning authority	EXPANDING EXPERIENCES is another popular strategy, seemingly with good impact to the traits that influence the ability to generate ideas.
9.1.8 Student interest	STUDENT INTEREST is a strategy that does not seem to strongly impact the personality traits that affect the ability to generate ideas. Moreover, it does seem to be positively impacting the ABILITY TO THINK INDEPENDENTLY and HIGHLY CURIOUS.
9.1.9 Less popular teaching strategies	Even though this thesis examined seven teaching strategies, nine more notable strategies were identified but not studied in such detail.
9.2.1 Playful	With the examined teaching strategies, PLAYFULNESS appears to be the most challenging personality trait to develop.
9.2.2 Lack of creativity oversight	Design schools seldom have a separate creativity class. Creativity is instead embedded throughout the curriculum.
9.3.1 Development of traits by a wide range of techniques	Personality traits are developed by a combination of teaching strategies that are (now) known to impact these traits positively.
9.3.2 Traits that are not believed to impact idea generation	There have been some traits that participants did not select as impacting the ability to generate ideas.
9.4 On the importance of teaching strategies	Idea generation is not an exclusive ability that only designers do. Moreover, designers are expected to be good at it. This is why teaching strategies are important in design schools.

10. Conclusion

This research identifies seven teaching strategies and their believed effect on personality traits that influence the ability to generate ideas. The primary area of investigation has been design education, but nonetheless it is more for the design students. The findings from the third research question (*on page 199*) demonstrate which teaching strategies trigger the most favourable idea generation personality traits. Most favourable refers to a set of design educators' traits (see section *8.1 on page 161*). Many of these teaching strategies match with signature pedagogies of the design domain, such as the studio, projects and the brief, dialogue and the critique⁴⁰ Overall, this dissertation offers readers and interested parties a better understanding of improving the ability to generate ideas. Teaching strategies can be reviewed by the relationship that they have with the personality traits.

Teaching strategies tend to have a strong relationship with some personality traits and a weaker relationship with others. That means each teaching strategy has a varying level of impact. With the results of this study, educators have various options. They can approach fostering idea generation by choosing one of the teaching strategies depending on their preference. Alternatively, they can review their personality traits. Upon selecting the preferred trait or traits that they want to trigger and grow, they can deploy the relevant teaching strategy that matches the favourable personality characteristic.

⁴⁰ Signature pedagogies explained *on page 72*

Suggestions for further research

This dissertation has been particularly fascinating to me, and I am excited to suggest possible avenues for future research. The suggestions for further research can be a way to substantiate the value of a dissertation by offering the next steps (White, 2011, p. 309). Several possibilities can be considered and are mentioned below.

- Culture perspective: Even though the point is to generalise throughout design education, it could be an excellent consideration to consider the cultural perspective. Western schools dominate the QS world rankings, and in this study, there have been only two non-western schools in the surveys, both based in Singapore. Even though Singapore is not a western country, in many ways, the multi-cultural and multi-racial environment that makes up Singapore is not strictly Asian either. It has strong European influences, especially on the way the educational system in the country is organised.
- As the Covid-19 pandemic is not yet overturned (as of writing), online teaching is currently the norm. Even after the global pandemic has receded, online teaching may be considered normal. It is possible that fully accredited undergraduate design programs taught entirely online may increase in popularity. Even though teaching online is not a new phenomenon, the high level of technology and adoption rate that the world is currently facing is perhaps setting a precedent for what is about to come. As design education has relied heavily on face-to-face teaching mode, investigating in this area is relevant, as it can help understand how online education can foster the ability to generate ideas and creativity in general.

Concluding thoughts

Why the results of this dissertation matter?

Education is more than training about developing skills, improving knowledge, and learning techniques. Education involves preparing students for life-long learning, resulting in the intellectual cultivation of the mind's capabilities.

Learners can encounter new situations and respond with imagination, ingenuity and creativity (Frascara, 2020). This PhD has been a small attempt to identify design educators' perceptions of fostering one of the abilities that will allow learners to respond to those new situations.

Teaching design is influenced by many aspects, including factors that are not immediately apparent. Factors such as local history, geography and economics or politics, and many more can all impact the design philosophy of a design school in a given place. (Muratovski, 2020). This PhD study is a first attempt to understand the complex teaching design topic and offer an overview of teaching strategies that design educators use in their classes. It is a start in the studies regarding the ability to generate ideas in design schools.

Stanford d.school's mission is *"to help people unlock their creative abilities and apply them to the world"*⁴¹. Rhode Island School of Design's mission is *"through its college and museum, is to educate its students and the public in the creation and appreciation of works of art and design, to discover and transmit knowledge and to make lasting contributions to a global society through critical thinking, scholarship and innovation"*⁴². Even though these prominent and highly ambitious goals may (at first) sound irrelevant to this dissertation's topic, the ability to generate ideas can be regarded as highly relevant in both mission statements. The ability

⁴¹ 'About'. Stanford d.School, <https://dschool.stanford.edu/about>. Accessed 05 May 2021.

⁴² Mission and Values | RISD. <https://www.risd.edu/about/mission-and-values>. Accessed 06 May 2021.

to generate ideas is a componential part of creativity and innovation (both mentioned in the missions above). These two missions from two of the world's best design schools showcase the importance and significance of the topic.

This dissertation is current and relevant research (see section 2.7 on page 16) and offers a detailed account of how design education impacts students' ability to generate ideas. One of the aims has been to enrich the literature and better understand suitable teaching strategies. The dissertation provides context for seven teaching strategies and offers a perspective on how the perceptions of design educators on how these teaching strategies affect students.

As explained in section *Error! Reference source not found. Error! Bookmark not defined.*, several beneficiaries have been identified:

1. Design students,
2. Design educators,
3. Design Institutions,
4. Design education scholars,
5. The researcher,
6. Design industry (that hires designers),
7. Other sectors, such as business, engineering, or HCI (human-computer interaction)

Each beneficiary has a benefit, either directly or indirectly. Perhaps the first two beneficiaries have the most gain, with the ultimate benefit towards to design students. The design students depend on their education quality, just like any other student attending a university with competitive entrance examinations. Having educators who can help students become stronger designers with a robust and confident ability to generate ideas is a plus for anyone attending a design school.

Sixteen strategies were identified, of which seven have been studied further. The sixteen strategies that were identified emerged out of a pool of twenty-four interviewees. As there are thousands of design educators globally, and each may use dozens of teaching strategies, many undocumented teaching strategies may be used. However, this dissertation is a first step in establishing some of the teaching strategies used in design education to foster the ability to generate ideas. Nonetheless, seven of them have been thoroughly examined from the sixteen teaching strategies to identify what personality traits they do develop. This identification is based on the perceptions of one hundred sixty-seven design educators who responded to a survey.

In summary, all teaching strategies are widespread. However, it appears that the most popular teaching strategy, the SUPPORTIVE LEARNING ENVIRONMENT, is the least impactful to the ability to generate ideas. It is a strategy where educators encourage the students to gain confidence and not be afraid of making mistakes—accepting all students and promoting the view that there are no stupid questions. The teaching strategy that appears to be the most impactful to the ability to generate ideas is expanding students' experiences. That means creating conditions where students get exposed to a higher volume of experiences. That may include sending students outside of the classroom or even travelling.

This section gives some significant conclusions, stated briefly as self-standing, independent statements. More detailed information about each of these key takeaways can be found in the relevant sections provided with each of the statements:

A. SUPPORTING ENVIRONMENT is the most prevalent strategy used by nearly ten out of ten educators. However, the data suggests that educators do not believe that this strategy influences idea generation as much as the other strategies examined in this dissertation. (Section 9.1.5 on page 221).

B. Three personality traits that impact the ability to generate ideas have been identified as crucial and are being developed through a wide range of teaching strategies. These are FLEXIBLE, meaning being able to shift thinking or to change a point of view. The ABILITY TO THINK INDEPENDENTLY. It is a trait about having a sense of autonomous mind and making decisions without relying upon instructors. Furthermore, finally, being CURIOUS, asking many questions and have a genuine interest in many things.

C. From all the teaching strategies examined in this dissertation, EXPANDING EXPERIENCES appears to be the most suitable teaching strategy for developing the ability to generate ideas. According to the data, educators believe it influences a wide range of personality traits related to idea generation (Section 9.1.6 on page 222).

D. Approximately 94% of educators who use QUESTIONING AUTHORITY believe that this strategy influences the ABILITY TO THINK INDEPENDENTLY (Section 9.1.7 on page 224).

E. Approximately 90% of educators who use REAL-LIFE believe that this strategy influences PROBLEM AWARENESS (Section 9.1.4 on page 220).

Creativity is a significant skill, and various sources suggest it will become increasingly significant (Beckford, 2020; World Economic Forum, 2016, 2020). As we (humanity) embrace the world ahead with more increased uncertainty, future designers will have to address problems never heard before. Many of the current problems, the pandemic, accessibility, climate change, depleting of resources, racism, inequality, fake news and more, may not be exactly new problems, as, throughout human history, there have been similar cases with similar problems. It can be argued that all of these are old problems resurfacing once again. Nonetheless, these problems' interconnectivity and scale level, together with new, emerging problems, is a novel unprecedented situation. Simultaneously, incredible technological advancements, such as big data,

artificial intelligence, generative design, and other technologies rapidly improve and enter daily life at a swift pace. Nonetheless, technology is merely a tool, and without humans using it, it is not creative.

Despite the technological progressions and advancements, computers and technology cannot yet compete with the human capacity to create and invent solutions. At the same time, the population of specialised professionals, such as technologists, scientists, and engineers, is also increasing rapidly. This specialisation rate has not left the design industry untouched: we (designers) are also going through a transformation of our industry. New types of specialised designers have been emerging (for a while now), such as the designer coder, the designer entrepreneur, the hybrid design researcher, the business designer and the social innovator (IDEO, 2014). Regardless of specialisation, creativity is a superior skill for any professional, especially for those dealing with problems or are being called to provide solutions.

Moreover, creativity is a proponent of human survival and human progress. As the world is embracing the future with global challenges as well as dealing with local problems, there is going to be a need of novel solutions. Designers will be offering suggestions and ideas on how to address these problems, and the ability to generate ideas will remain crucial, as ever.

Pursuing a study on how to foster the ability to generate ideas is -in principle- a study about human nature. Understanding how design learners improve their idea generation skills is a current, relevant, and future-proof study. Ideas is what got humanity to where it is, and ideas is what humanity will use to go on forward. After all H.G Well : *Human history is, in essence, a history of ideas.*

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Appendix

Appendix 1 – Publication search list

The list in the following pages showcases all the publication titles that were retrieved upon searching for the following two long-tail keywords⁴³ (one per line)

“idea generation” “design education” “teaching strategies”

“idea generation” “design education” “teaching methods”

The results from these two long-tail keywords were combined and all duplicate publications (publications that appeared on both searches) were reduced to a single entry. The list was populated by Publish or Perish, a software program that retrieves and analyses academic citations. Some of the publications in the list do not have full journal titles for an unknown reason. Presumably, the software has some retrieval limitations when getting the full journal title. As such, the list was exported in APA format and provided in this Appendix ‘as is’, for your reference.

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Abel, C, Abidin, W, Adams, E, Andreasen, MM, & ... Contributors to Design Policy Conference: listing and synopses.

Achillas, C, Baniyas, G, Tzetzis, D, Kyratsis, P, & ... INVESTING IN PRODUCT DESIGN EDUCATION IN TIMES OF ECONOMIC CRISIS. researchgate.net

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Afacan, Y (2018). Student experiences of blended learning in interior architecture. Journal of Information Technology Education ..., repository.bilkent.edu.tr

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⁴³ Long-tail keywords are more specific keyword phrases that produce more specific search results.

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Appendix 2 – Sheet with traits given to interviewees

Factors that influence ability to generate ideas.

You will be asked to select the top five most crucial factors that influence ability to generate ideas.

(factors listed alphabetically)

- 1 Able to change one's point of view
- 2 Able to think independently
- 3 Accommodate opposites (introvert/extrovert, selfish/unselfish and so on)
- 4 Adaptive
- 5 Aesthetic sensibility
- 6 Being aware of existing problems
- 7 Combining thoughts to constitute new patterns or structures
- 8 Imaginative
- 9 Making connections between seemingly unrelated ideas
- 10 Naturally curious
- 11 Playful
- 12 Produce many ideas
- 13 Risk-taking
- 14 Tolerant of ambiguity
- 15 Uses comparisons or analogies make new connections
- 16 Hard working

Oustamanolakis Mike

PhD Candidate at the School of Design

The Hong Kong Polytechnic University

Appendix 3 – Information sheet

INFORMATION SHEET

Developing pedagogical methodology and approaches to ideation for design students

You are invited to participate on a study conducted by Mike Oustamanolakis, who is a PhD candidate at the School of Design in The Hong Kong Polytechnic University.

This project has been approved by the Human Subjects Ethics Sub-committee of the Hong Kong Polytechnic University (No #HSEARS20190627002).

Design education aims to develop competencies that are essential for future design practitioners, including ideation ability. This study aims to identify and understand the pedagogies help improve ideation in design education.

The study will involve interviewing design schools to collect information-rich samples. It is hoped that this information will help to understand the pedagogical approaches for ideation.

The interview should not result in any undue discomfort, but it will be audio recorded. All information related to you will remain confidential, your identity will be concealed, and you will be identifiable only by codes only known to the researcher and PhD supervisor. You do have every right to withdraw from the study before or during the interview without penalty of any kind.

If you would like to get more information about this study, please contact Mike (tel. no. +852 5967 , email 1790@)

If you have any complaints about the conduct of this research study, please do not hesitate to contact Miss Cherrie Mok, Secretary of the Human Subjects Ethics Sub-Committee of The Hong Kong Polytechnic University in writing (c/o Research Office of the University) stating clearly the responsible person and department of this study.

Thank you for your interest in participating in this study.

Mike Oustamanolakis

Investigator

Appendix 4 – Consent form

CONSENT TO PARTICIPATE IN RESEARCH

Developing pedagogical methodology and approaches to ideation for design students

I hereby consent to participate in the captioned research conducted by Mike Oustamanolakis.

I understand that information obtained from this research may be used in future research and published. However, my right to privacy will be retained, i.e., my personal details will not be revealed.

The procedure as set out in the attached information sheet has been fully explained. I understand the benefit and risks involved. My participation in the project is voluntary.

I acknowledge that I have the right to question any part of the procedure and can withdraw at any time without penalty of any kind.

Signature of participant

Name of researcher Mike Oustamanolakis

Signature of researcher

Date

Appendix 5 – Negative traits

Table 72. Negative traits of creative people (Davis 2004, p. 93).

<i>1. Egotistical</i>		
<i>• Claims rest of the parade is out of step</i>	<i>• Intolerant • Self-centered</i>	<i>• Selfish • Snobbish</i>
<i>2. Impulsive</i>		
<i>• Acts without planning • Compulsive • Disorganized with unimportant matters</i>	<i>• Irresponsible • Uninterested in details capricious</i>	<i>• Disorderly • Impatient • Tactless</i>
<i>3. Argumentative</i>		
<i>• Autocratic • Defiant • Intolerant • Refuses to participate in class activities</i>	<i>• Cynical • Demanding • Rebellious • Resists Domination • Stubborn</i>	<i>• Uncooperative • Sarcastic • Tactless • Questions rules, conventions, law, authority</i>
<i>4. Risk-Taking</i>		
<i>• Courageous • Does not mind be different • Little regard for social conventions, rules, or laws</i>	<i>• Not afraid to try something new • Optimistic • Opportunistic • Speculative</i>	<i>• Rejects limits imposed by others • Willing to cope with failure • Willing to cope with hostility</i>
<i>4. Childish</i>		
<i>Immature</i>	<i>Sloppy</i>	<i>Silly</i>
<i>5. Absent-Minded</i>		
<i>• Careless • Mind wanders</i>	<i>• Forgetful • Watches windows</i>	<i>• Selfish • Snobbish</i>
<i>6. Neurotic</i>		
<i>• Aloof • Moody • Temperamental</i>	<i>• Uncommunicative • Low frustration tolerance</i>	<i>• Sociopathic, mildly • Unable to control emotions</i>
<i>7. Hyperactive</i>		
<i>Overactive physically or mentally</i>	<i>Restless</i>	

Appendix 6 – Structure of intellect model

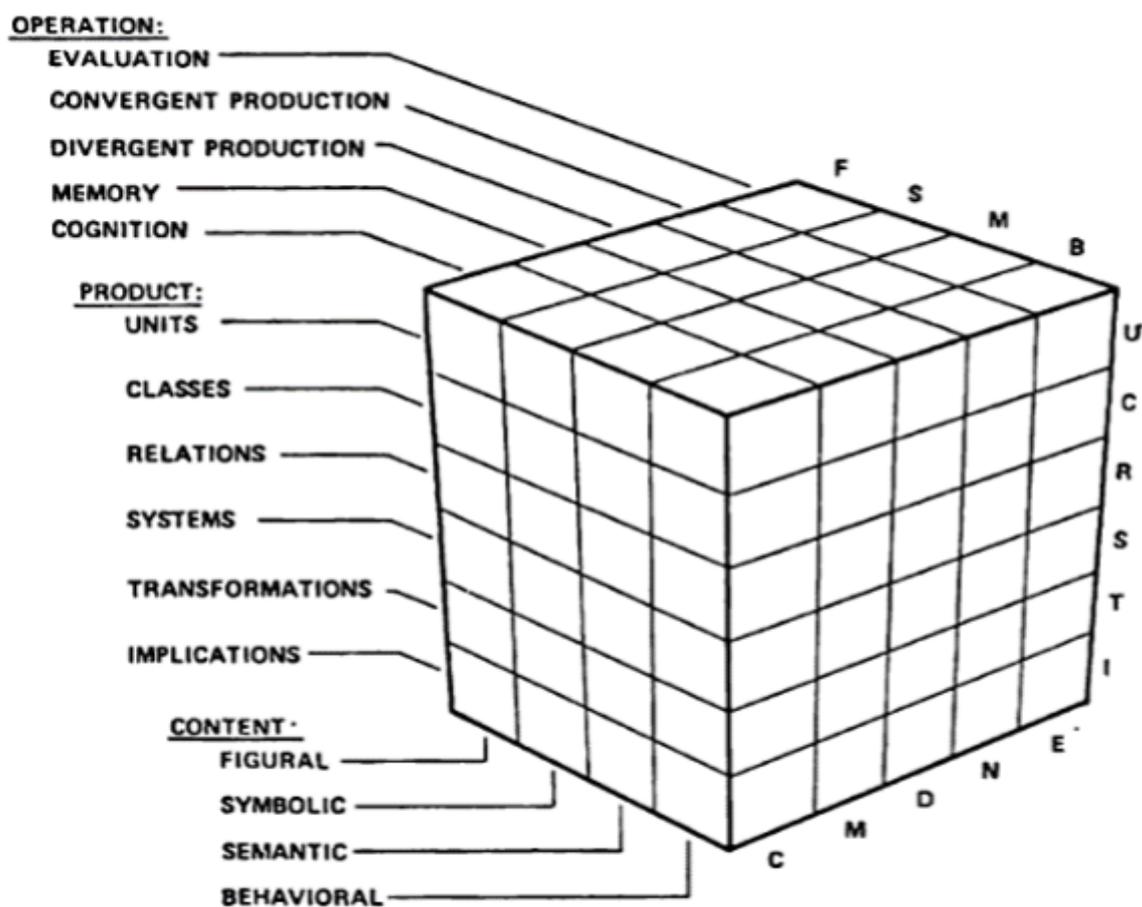


Figure 19. The structure of intellect model (J. P Guilford, 1968, p. 10)

Appendix 7 – Terms across the three studies

<i>Study 1</i>		<i>Study 2</i>	<i>Study 3</i>
<i>Colloquial terms</i>	<i>Academic terms</i>		
Making connections between seemingly unrelated ideas	Seeing relationships	Making connections between seemingly unrelated ideas	Making connections between seemingly unrelated ideas (Seeing relationships)
Able change one's point of view	Flexibility	Able to change one's point of view	Able to change one's point of view (Flexibility)
Able to think independently	Independence of thought	Able to think independently	Able to think independently
Accommodate opposites	Integration of dichotomies	Accommodate opposites (introvert/extrovert, selfish/unselfish and so on)	Accommodating opposites (Introvert/extrovert, selfish/unselfish and so on)
Adaptive	Adaptability; Making do with what at hand to reach goals	Adaptive	Adaptive
Aesthetic sensibility	Aesthetic sensitivity and/or interests	Aesthetic sensibility	Aesthetic sensibility
Being aware of existing problems	Problem sensitivity	Being aware of existing problems	Being aware of existing problems
Combining thoughts to constitute new patterns or structures	Synthesizing	Combining thoughts to constitute new patterns or structures	Combining thoughts to constitute new patterns or structures (Synthesising)
Naturally curious	High levels of curiosity	Naturally curious	Curiosity
Imaginative	Capacity for fantasy or imagination	Imaginative	Imaginative
Playful	Playfulness	Playful	Playful
Produce many ideas	Fluency	Produce many ideas	Produce many ideas
Risk-taking	Risk-taking	Risk-taking	Risk-taking
Uses comparisons or analogies make new connections	Metaphorical thinking	Uses comparisons or analogies make new connections	Uses comparisons or analogies make new connections (Metaphorical thinking)
Willing to work hard	Willing to work hard: Liking and capacity for thinking and work	Willing to work hard	Willing to work hard
Tolerant of ambiguity	Tolerance for ambiguity	Tolerant of ambiguity	
Has analytical skills	Analysing		
Consider himself or herself as creative	Awareness of creativeness: Sees himself or herself as creative		
Desire resolve ambiguity & disorder	Desiring to resolve ambiguity or bringing order to disorder		
Able to elaborate on ideas	Elaboration		
Energetic	Energetic (or hyperactive-overactive physically or mentally)		
Able to concentrate and be absorbed into the work	Intense concentration and absorption in work		
Works intuitively	Intuition		
Needs alone time	Need for alone time: Interest in reflective thinking:		
Work on their own to finish a project	Need for and-or demonstration of autonomy, self-directed or self-disciplined		
Emotionally sensitive	Open to feelings and emotions: Shows emotional sensitivity		
Not afraid of the unknown	Openness to experience and ideas, not afraid of the unknown		
Produces original ideas	Originality		
Determined	Persistence or perseverance		
Enjoys complexity	Preferring complexity or understanding complexity		
Rejects stereotypes	Rejects sex stereotyping, free from other stereotypes		
Likes re-organising	Reorganizing or redefining		
Sense of humour	Sense of humour and/or facility for producing humour		
Outspoken & spontaneous	Tenacity and lack of inhibition in expressing of opinion		
Critical of authority	Unwillingness to accept authoritarian assertions throughout critical examination		
Willing to grow	Willingness to grow		

Appendix 8 – Third study data

This section portrays the data visualised and ordered in additional ways than *Table 63 on page 201*, which portrays the results of study 3. While the next pages contain identical information as Table 63 and may appear redundant, the scope of this addition in this dissertation is to provide each teaching strategy on its own right and displaying the personality traits ordered accordingly. The aim to provide a different perspective, helping readers and researchers comprehend and understand the data by looking at it from several angles, as other scholars and researchers may use this data and other studies. As such, while the next pages contain redundant information, the charts, graphics, and tables provided are also a separate contribution to the body of knowledge, while still belonging to this dissertation's body. Each figure is provided with a short description, other than the figure title.

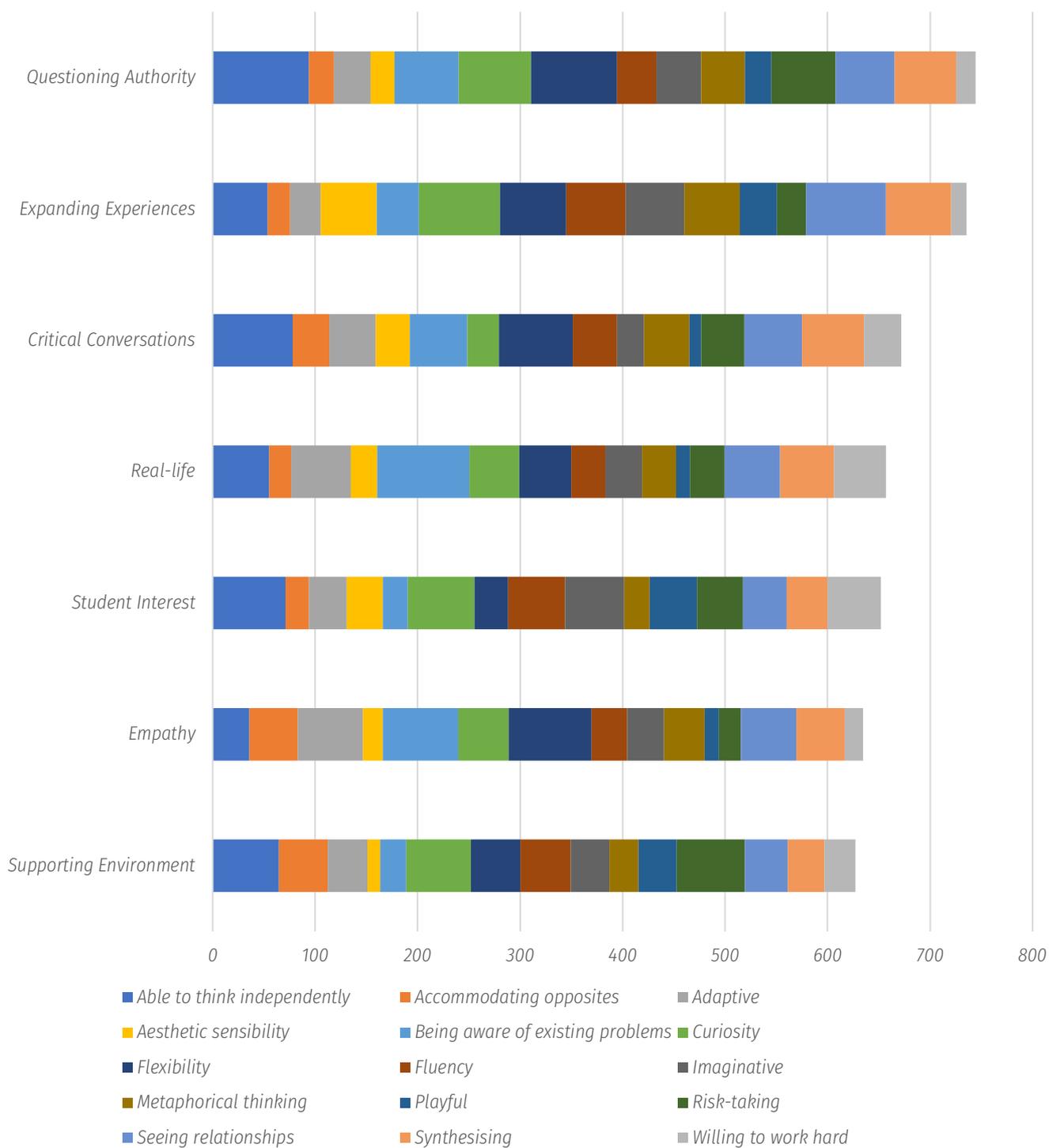


Figure 20. Teaching strategies stacked up by personality trait percentages

To understand this please refer to section 7.4 Study 3- Survey on page 148. Longer bar means more educators believe the teaching strategy is fostering more personality traits.

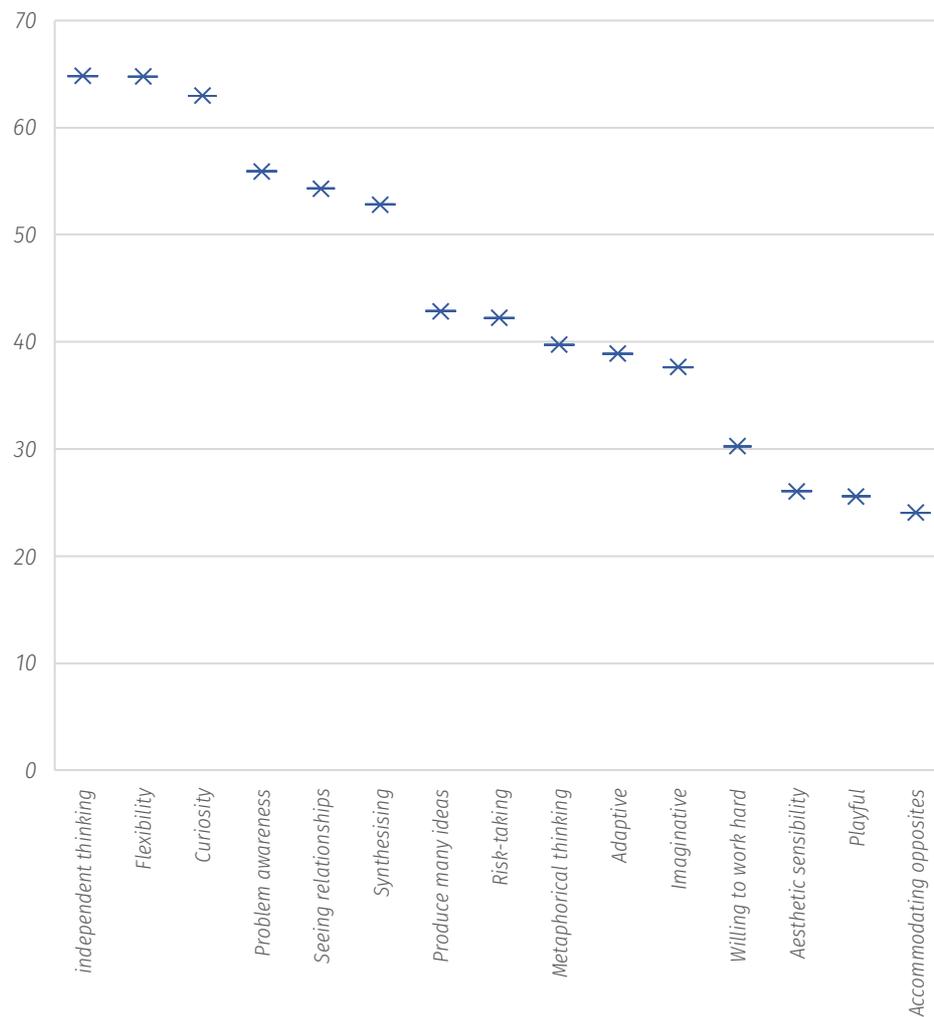


Figure 21. Chart with medians of the personality traits

A higher figure indicates that the personality trait being fostered well by multiple teaching strategies (from the pool of the seven strategies shown in [Figure 20 on page 314](#)). In contrast, lower figures indicate that these personality traits are not being fostered with these teaching strategies.

The next pages contain all each teaching strategy in two formats, as a table that portrays every personality trait with its respective percentage and one spider diagram. The percentage refers to the number of responders who use the teaching strategy and believe it develops the respective personality traits.

Each table is also transformed into a spider diagram to help visual readers comprehend the data in a more graphical representation. All diagrams are also provided in a smaller format without legend, to make visual comparisons more convenient to the reader.

Three remarks regarding the spider diagrams:

- a) larger areas inside the shape imply that educators believe the more influential the teaching strategy is, in developing personality traits that affect idea generation.
- b) The closer a personality trait is to the edge; the more educators believe this trait is being fostered through this strategy
- c) the more round a shape is, the more evenly this strategy design develops all personality traits. On the contrary, the more abstract a shape is the more variance this strategy has. More variance means this strategy is believed to develop some traits more than some others. It should be noted that these interpretations are based on the perception of design educators.

Table 73. Supporting Environment

<i>Risk-taking</i>	66.67
<i>Able to think independently</i>	64.81
<i>Highly curious</i>	62.96
<i>Fluent</i>	49.38
<i>Flexible</i>	48.15
<i>Accommodating opposites</i>	47.53
<i>Seeing relationships</i>	41.98
<i>Adaptive</i>	38.89
<i>Imaginative</i>	37.65
<i>Playful</i>	37.04
<i>Synthesising</i>	35.80
<i>Hard working</i>	30.25
<i>Metaphoric thinker</i>	28.40
<i>Being aware of existing problems</i>	25.31
<i>Aesthetic sensibility</i>	12.35

Table 74. Questioning Authority

<i>Able to think independently</i>	93.98
<i>Flexible</i>	84.21
<i>Highly curious</i>	70.68
<i>Being aware of existing problems</i>	62.41
<i>Risk-taking</i>	62.41
<i>Synthesising</i>	60.15
<i>Seeing relationships</i>	57.89
<i>Imaginative</i>	43.61
<i>Metaphoric thinker</i>	42.86
<i>Fluent</i>	38.35
<i>Adaptive</i>	36.09
<i>Playful</i>	25.56
<i>Accommodating opposites</i>	24.06
<i>Aesthetic sensibility</i>	23.31
<i>Hard working</i>	18.80

Table 75. Real-life

<i>Being aware of existing problems</i>	90.14
<i>Adaptive</i>	57.75
<i>Able to think independently</i>	54.93
<i>Seeing relationships</i>	54.23
<i>Synthesising</i>	52.82
<i>Hard working</i>	50.70
<i>Flexible</i>	50.7
<i>Highly curious</i>	48.59
<i>Imaginative</i>	35.92
<i>Risk-taking</i>	33.80
<i>Fluent</i>	33.10
<i>Metaphoric thinker</i>	33.10
<i>Aesthetic sensibility</i>	26.06
<i>Accommodating opposites</i>	21.83
<i>Playful</i>	13.38

Table 76. Expanding Experiences

<i>Highly curious</i>	78.85
<i>Seeing relationships</i>	78.21
<i>Flexible</i>	64.74
<i>Synthesising</i>	63.46
<i>Fluent</i>	58.33
<i>Imaginative</i>	57.05
<i>Aesthetic sensibility</i>	55.13
<i>Able to think independently</i>	53.85
<i>Metaphoric thinker</i>	53.85
<i>Being aware of existing problems</i>	41.03
<i>Playful</i>	36.54
<i>Adaptive</i>	29.49
<i>Risk-taking</i>	28.21
<i>Accommodating opposites</i>	21.79
<i>Hard working</i>	14.74

Table 77. Critical Conversations

<i>Able to think independently</i>	78.26
<i>Flexible</i>	72.05
<i>Synthesising</i>	60.25
<i>Seeing relationships</i>	56.52
<i>Being aware of existing problems</i>	55.90
<i>Adaptive</i>	45.34
<i>Metaphoric thinker</i>	44.10
<i>Fluent</i>	42.86
<i>Risk-taking</i>	42.24
<i>Hard working</i>	36.65
<i>Accommodating opposites</i>	35.40
<i>Aesthetic sensibility</i>	33.54
<i>Highly curious</i>	31.06
<i>Imaginative</i>	26.71
<i>Playful</i>	11.18

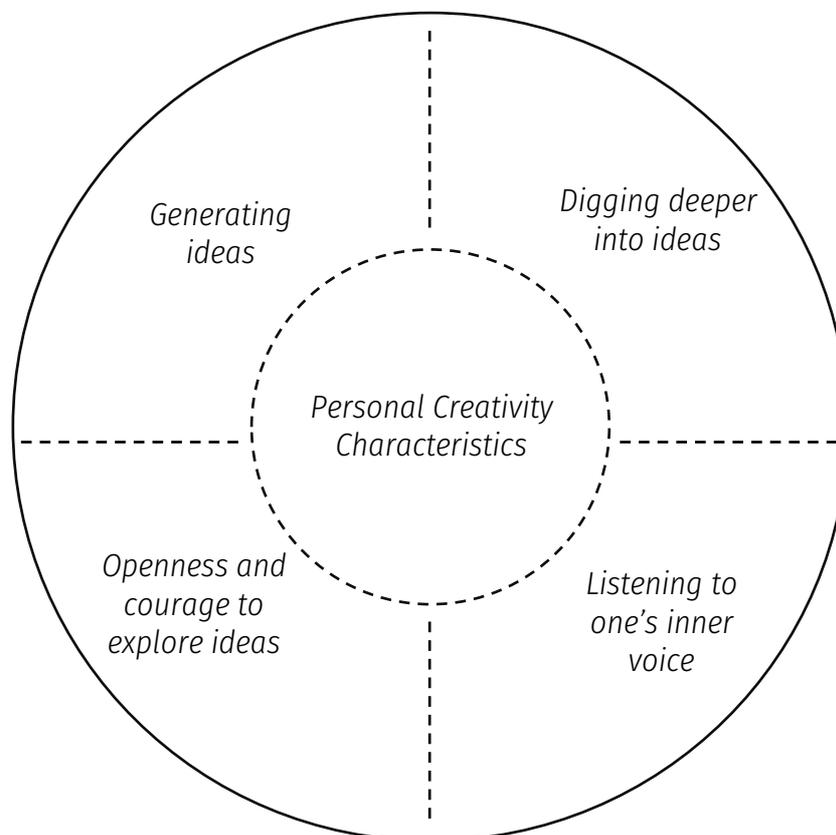
Table 78. Empathy

<i>Flexible</i>	80.79
<i>Being aware of existing problems</i>	73.51
<i>Adaptive</i>	63.58
<i>Seeing relationships</i>	54.30
<i>Highly curious</i>	49.01
<i>Synthesising</i>	47.02
<i>Accommodating opposites</i>	47.02
<i>Metaphoric thinker</i>	39.74
<i>Imaginative</i>	35.76
<i>Able to think independently</i>	35.76
<i>Fluent</i>	35.10
<i>Risk-taking</i>	21.19
<i>Aesthetic sensibility</i>	19.87
<i>Hard working</i>	17.88
<i>Playful</i>	13.91

Table 79. Student Interest

<i>Able to think independently</i>	71.05
<i>Highly curious</i>	65.13
<i>Imaginative</i>	57.24
<i>Fluent</i>	55.92
<i>Hard working</i>	51.97
<i>Playful</i>	46.05
<i>Risk-taking</i>	44.74
<i>Seeing relationships</i>	42.76
<i>Synthesising</i>	40.13
<i>Adaptive</i>	36.84
<i>Aesthetic sensibility</i>	34.87
<i>Flexible</i>	32.89
<i>Metaphoric thinker</i>	25.00
<i>Being aware of existing problems</i>	24.34
<i>Accommodating opposites</i>	23.03

Appendix 9 – Personal creativity characteristics



*Figure 22. Categories of personal creativity characteristics.
(Treffinger et al., 2002, p. 12)*

The figure portrays these categories as an entire compound, where each one of these categories is a contributing component. This visualisation is adapted from the report.

Appendix 10 – Creativity & trait lists

<i>Table 80. Selected cognitive & cognitive-related factors (Carroll, 1993, p. 75)</i>	
<p><i>Gf</i> ("fluid intelligence") factors</p> <ol style="list-style-type: none"> 1. Induction 2. Logical reasoning 3. General reasoning 4. Integrative process 5. Judgment 6. Planning <p><i>Gc</i> ("crystallized intelligence") factors</p> <ol style="list-style-type: none"> 1. Verbal knowledge 2. Numerical facility <p><i>Gv</i> ("general visual perception") factors</p> <ol style="list-style-type: none"> 1. Spatial orientation 2. Spatial visualization 3. Speed of closure 4. Flexibility of closure 5. Spatial scanning 6. Length estimation 7. Verbal closure 8. Perceptual speed 9. Perceptual alternations 10. Figure illusions <p><i>Ga</i> ('general auditory perception') factors</p> <ol style="list-style-type: none"> 1. Auditory resistance 2. Loudness 3. Pitch quality <p><i>Gm</i> ('general memory') factors</p> <ol style="list-style-type: none"> 1. Associative memory 2. Memory span 3. Visual memory 4. Musical memory 	<p>Miscellaneous affective-cognitive factors</p> <ol style="list-style-type: none"> 1. Attention 2. Carefulness 3. Persistence 4. Perseveration <p>Speed factors</p> <ol style="list-style-type: none"> 1. Speed 2. Speed of judgment <p>Fluency and production factor:</p> <ol style="list-style-type: none"> 1. Associational fluency 2. Expressional fluency 3. Ideational fluency 4. Word fluency 5. Flexibility of use 6. Figural flexibility 7. Naming speed 8. Speech fluency 9. Speed of association 10. Originality Semantic redefinition 11. Sensitivity to problems <p>Selected psychomotor factors</p> <ol style="list-style-type: none"> 1. Aiming 2. Ambidexterity 3. Speed of articulation 4. Finger dexterity 5. Manual dexterity 6. Psychomotor coordination 7. Reaction time 8. Tapping

Table 81. Abilities in the domain of idea production (Carroll, 1993, p. 438)

<i>1. Ideational Fluency</i>	Speed in thinking and reporting ideas in a fixed amount of time.
<i>2. Naming Facility</i>	Speed in giving a name (labelling) an accepted name for something
<i>3. Associational Fluency</i>	Speed in thinking and reporting/verbalising semantically associated responses about a given stimulus.
<i>4. Expressional Fluency</i>	Speed in expressing syntactically coherently ideas.
<i>5. Word Fluency</i>	Speed in thinking language units (words) with phonemic or graphemic properties related to a previous stimulus.
<i>6. Sensitivity to Problems</i>	Speed of successfully thinking solutions to problems
<i>7. Originality/Creativity</i>	Speed of successfully thinking unusual or original ideas as a response to a previous stimulus.
<i>8. Figural Fluency</i>	Speed of successfully responding to specified tasks (usually by drawing)
<i>9. Figural Flexibility</i>	Speed of successfully responding to figural tasks that may require adaptation or varied approaches

Table 82. Characteristics of creative people from less creative people

1. Accepts disorder	29. Appears haughty and self-satisfied at times	57. Self-assertive
2. Adventurous	30. Likes solitude	58. Self-starter
3. Strong affection	31. Independence in judgment	59. Self-aware
4. Altruistic	32. Independent in thinking	60. Self-confident
5. Awareness of others	33. Individualistic	61. Self-sufficient
6. Always baffled by something	34. Intuitive	62. Senses of destiny
7. Attracted to disorder	33. Industrious	63. Sense of humour
8. Attracted to mysterious	36. Introversive	64. Sensitive to beauty
9. Attempts difficult jobs (sometimes too difficult)	37. Keeps unusual hours	65. Shuns power
10. Bashful outwardly	38. Lacks business ability	66. Sincere
11. Constructive in criticism	39. Makes mistakes	67. Not interested in small details
12. Courageous	40. Never bored	68. Speculative
13. Deep and conscientious conventions	41. Nonconforming	69. Spirited in disagreement
14. Defies conventions of courtesy	42. Not hostile or negativistic	70. Strives for distant goals
15. Defies conventions of health	43. Not popular	71. Stubborn
16. Desires to excel	44. Oddities of habit	72. Temperamental
17. Determination	45. Persistent	73. Tenacious
18. Differentiated value-hierarchy	46. Becomes preoccupied with a problem	74. Tender emotions
19. Discontented	47. Preference for complex ideas	75. Timid
20. Disturbs organization	48. Questioning	76. Thorough
21. Dominant (not in power sense)	49. Radical	77. Unconcerned about power
22. Emotional	50. Receptive to external stimuli	78. Somewhat uncultured, primitive
23. Emotionally sensitive	51. Receptive to ideas of others	79. Unsophisticated, naive
24. Energetic	52. Regresses occasionally	80. Unwilling to accept anything on mere say-so
25. A faultfinder	53. Rejection of suppression as a mechanism of impulse control	81. Visionary
26. Does not fear being thought 'different'	54. Rejection of repression	82. Versatile
27. Feels whole parade is out of step	55. Reserved	83. Willing to take risks
28. Full of curiosity	56. Resolute	84. Somewhat withdrawn and quiescent

Table 83. Characteristics of creative people. (Davis 2004, p. 85).

1. Aware of Creativeness		
Creativity conscious	Values own creativity	Values originality and creativity
2. Original		
<ul style="list-style-type: none"> • A dreamer • Adapts, is adaptable • Alert to novelty • Avoids entrenched ways of thinking • Avoids perceptual sets • Bored by the routine & obvious • Builds & rebuilds • Clever • Constructs • Does things differently • Enjoys pretending • Fantasizes 	<ul style="list-style-type: none"> • Flexible in ideas and thought • Full of ideas • Imaginative • Improves • Innovative • Inventive • Is a "What if?" person • Manipulates ideas • Modifies (objects, systems, institutions) • Nonconforming • Odd habits • Radical 	<ul style="list-style-type: none"> • Resourceful • Sees things in new ways • Selects the more unusual solutions • Unconventional in behaviour • Unique • Uses analogies, metaphors • Uses imagery, visualization • Uses wide categories • Versatile • Visionary
3. Independent		
<ul style="list-style-type: none"> • Aloof • Assertive • Capable • Confident, believe in oneself • Critically examines authoritarian pronouncements • Dissatisfied with the status quo • Does not fear to be different • Dresses differently • Egotistical • Freedom of spirit that rejects limits by others 	<ul style="list-style-type: none"> • Independent in judgments • Individualistic • Informal • Intense independence • Internally controlled, inner-directed • May have a conflict between self-confidence and self-criticism • May need to maintain distance from peers • May not fit the environment • Strong-willed 	<ul style="list-style-type: none"> • Unconventional • May resist societal demands • Prefers working alone • Radical & spirited in disagreement • Self-accepting • Self-confident • Self-esteem high • Self-sufficient
4. Risk-Taking		
<ul style="list-style-type: none"> • Courageous • Does not mind being different • Little regard for social conventions, rules, or laws 	<ul style="list-style-type: none"> • Not afraid to try something new • Optimistic • Opportunistic • Speculative 	<ul style="list-style-type: none"> • Rejects limits imposed by others • Willing to cope with failure • Willing to cope with hostility

(Continues on page 92)

Table 83 (Continued from the previous page)

5. High Energy		
<ul style="list-style-type: none"> · Action oriented · Active · Adventurous · Alert · Ambitious · Blazing drive · Capable of concentrating · Devotion to study or work · Drive for accomplishment and recognition · Drive to produce · Driving absorption · Enjoys telling about discoveries & inventions · Enthusiastic 	<ul style="list-style-type: none"> · Excitable · Exciting · Expressive in gestures, body language · Gets lost in a problem · Goes beyond assigned tasks · Hard working · High commitment · High intrinsic motivation · High need for competence in meeting challenges · Hurried · Impulsive · Industrious · Joy in work 	<ul style="list-style-type: none"> · Overactive, hyperactive · Persevering · Persistent · Persuasive · Problem centred · Quick · Restless Sensation seeking · Seeks interesting situations · Serious · Spontaneous · Unwilling to give up · Vision & sense of destiny · Vitality
6. Curious		
<ul style="list-style-type: none"> · Asks "Why?" · Asks many questions · Distractible · Enjoys taking things apart 	<ul style="list-style-type: none"> · Inquisitive · Experiments · Likes to hear other people's ideas 	<ul style="list-style-type: none"> · Open to the irrational · Seeks interesting situations · Wide interests
7. Sense of Humour		
<ul style="list-style-type: none"> · Childlike freshness in thinking · Playful 	<ul style="list-style-type: none"> · Plays with ideas · Sharp-witted 	
8. Capacity for Fantasy		
<ul style="list-style-type: none"> · Animistic and magical thinking · Believes in psychical phenomena and flying saucers 	<ul style="list-style-type: none"> · Had imaginary playmate(s) as a child · Mixes truth and fantasy/fiction 	<ul style="list-style-type: none"> · Theatrical interests
9. Attracted to Complexity & Ambiguity		
<ul style="list-style-type: none"> · Attracted to novelty · Attracted to the mysterious, asymmetrical 	<ul style="list-style-type: none"> · Is a complex person · Tolerant of ambiguity · Tolerant of disorder 	<ul style="list-style-type: none"> · Tolerant of incongruity
10. Artistic		
<ul style="list-style-type: none"> · Aesthetic interests · Artistic interests · Enjoys art, music, creative dramatics 	<ul style="list-style-type: none"> · Expressive · Good designer · Sensitive to aesthetic characteristics 	<ul style="list-style-type: none"> · Sensitive to beauty
11. Open-Minded		
<ul style="list-style-type: none"> · Liberal · Open to impulses 	<ul style="list-style-type: none"> · Open to new experiences and growth 	<ul style="list-style-type: none"> · Receptive to new ideas · Receptive to other viewpoints
12. Thorough		
<ul style="list-style-type: none"> · Disciplined, committed to one's work 	<ul style="list-style-type: none"> · Organized · Perfectionistic 	

(Continues on page 93)

Table 83 (Continued from the previous page)

13. Needs Alone Time		
<ul style="list-style-type: none"> • Internally preoccupied • Reflective 	<ul style="list-style-type: none"> • Introspective • Reserved 	
14. Perceptive		
<ul style="list-style-type: none"> • Discerning • Good at problem finding • Heightened sensitivity to details, patterns, other phenomena 	<ul style="list-style-type: none"> • Insightful • Intuitive • Observant • Sees implications 	<ul style="list-style-type: none"> • Sees relationships • Senses what should follow the solution • Uses all senses in observing
15. Emotional		
<ul style="list-style-type: none"> • Can express feelings & emotions • Desires attention, praise, & support • Experiences deep emotions • Experiences soaring highs & deep lows 	<ul style="list-style-type: none"> • Immature • Introverted • Impulsive • Irresponsible • Low frustration tolerance • Moody 	<ul style="list-style-type: none"> • Selfish • Sensitive • Withdrawn
16. Ethical		
<ul style="list-style-type: none"> • Altruistic • Empathic • Helpful 	<ul style="list-style-type: none"> • Honest & courageousness • Idealistic • Philosophic 	<ul style="list-style-type: none"> • Sensitive to the needs of others

Table 84. *Personality traits affecting creativity*

	Personality characteristics	Divergent Thinking	Convergent Thinking	Maturity
Able to see relationships			✓	
Able to synthesise			✓	
Absorbed in work				✓
Adaptive	✓			
Aesthetic sensitivity	✓			
Analytical			✓	
Elaborative		✓		
Energetic				✓
Flexible		✓		
Fluent		✓		
Hard-working				✓
Highly curious	✓			
Humorous	✓			
Imaginative	✓			
Independent of thought				✓
Integrative of dichotomies	✓			
Intolerant of ambiguity			✓	
Intuitive	✓			
Metaphoric thinker		✓		
Open to emotions	✓			
Open to experience and ideas	✓			
Original		✓		
Perceive the self as creative				✓
Persistent or perseverant				✓
Playful	✓			
Preferring complexity			✓	
Questioning authority	✓			
Reclusive				✓
Reorganizing or redefining			✓	
Risk-taking	✓			
Self-disciplined				✓
Sensitive to problems	✓			
Supportive of gender equality				✓
Uninhibited in expressing an opinion	✓			
Willing to grow	✓			
Tolerant of ambiguity	✓			

Appendix 11 – Design ladder pedagogy

Table 85. Educational Design Ladder Pedagogy & Curriculum (Abridged)
(Wrigley & Straker, 2017)

Step	1	2	3	4	5
<i>Knowledge</i>	Factual	Conceptual	Conceptual	Procedural	Metacognitive
<i>D.T level</i>	Foundation level	Product level	Project level	Business level	Professional level
<i>Theme</i>	Theories, methods, and philosophies	Product content design	Design management	Business strategy	Personal development and leadership
<i>SOLO taxonomy</i>	Knowledge comprehension	Application	Analysis	Synthesis	Evaluation
<i>Verbs</i>	Arrange, define, describe, label, list, memorise, recognise, relate, reproduce, select, explain, reiterate, reword, critique, classify, summarise, illustrate, translate	Use, apply, discover, manage, execute, solve, produce, implement, construct, change, prepare, conduct, perform, react, respond, role-play	Analyse, break down, catalogue, compare, quantify, measure, test, examine, experiment, relate, graph, diagram, plot, extrapolate, value, divide	Develop, plan, build, create, design, organise, revise, formulate, propose, establish, assemble, integrate, re-arrange, modify	Review, justify, assess, present a case for, defend, report on, investigate, direct, appraise, argue, project-manage
<i>Topics</i>	Reflection, ideation , design process, design history, defining design, creative thinking (idea generation) group dynamics, wicker problems, design contexts, visualisation, experimentation, prototyping	Idea generation , user focus, concepts, aesthetics, communicating visually, iterate and evolve design theoretical and practical aspects of design, sketching, form, and function	New product design and development, project management, marketing research, market identification and requirements, opportunity mapping, scenario planning, capital and variable costs, environmental requirements	Strategic design, business frameworks, service design, comparative analyses of business opportunities, branding strategies, brand management, business plans, budgets, financial management	Integrate principles of client service provision, advertising, marketing, leadership, competitive threats, innovative concepts, change management, innovation, entrepreneurship, reflective practice, professional development
<i>Learning modes</i>	Lectures, tutorials, design charrette, group work, lectures, tutorials, online modules, discussions, panel discussion, case studies	Short collaborative design projects, workshops, lectures, tutorials, field study, individual and group challenges	Workshops, partner with industry sponsors, lectures, tutorials, course readings	Workshops, industry projects, tutorials, study visits, online class discussions, group activities, individual research, self-directed learning	Work-integrated learning, digital lectures, online discussion, independent research, Skype, blog posts, wikis, peer coaching

Appendix 12 – Literature Review Logistics

Table 86. Literature Review Characteristics

<i>Eligibility criteria</i>	<p>Literature that has been selected had to suit these characteristics.</p> <ul style="list-style-type: none"> A) Addressing the topic of improving the ability to generate ideas or creativity. B) Published in English. C) Must be academic literature or authored by researchers, scholars, and academics. D) Non-academic literature was avoided but, depending on authority, was not discerned. E) Publications in the context of design education were preferred.
<i>Ineligibility criteria</i>	<p>Literature that has been excluded or avoided in this study.</p> <ul style="list-style-type: none"> A) Psychological studies that address generating suicidal ideation. B) Literature addressing idea generation in other disciplines, for instance, arts, science, business, or other non-design related areas. C) Literature that is explicitly addressing non-adult, non-higher education. D) Literature addressing creativity and idea generation as characteristic of giftedness. E) Studies that investigate the impact of external factors on idea generation (such as the use of technology or politics). F) Studies on improving ideation skills in the industry (other than the design) or laboratory.
<i>Data items</i>	<ul style="list-style-type: none"> A) Journal papers B) Conference papers C) PhD and Master theses D) Reports from government and industry bodies and other organisations. E) Non-fiction published literature
<i>Duration</i>	<p>This doctoral project was started in late 2017 and, until the submission date, has continued for four years.</p>
<i>Period of the literature</i>	<p>There has not been any limitation on how old the literature can be. The only such restriction has been on reports from industry bodies, in which reports older than 20 years (published before 2000) were avoided.</p>
<i>Search strategy</i>	<p>Terms like the following were deployed.</p> <ul style="list-style-type: none"> “Idea generation” AND “Design education.” “Idea generation” AND “Design school.” “improving idea generation.” “encouraging idea generation.” “fostering idea generation.” “developing idea generation.”
<i>Information sources</i>	<p>These sources were used to discover the proper literature. Sources D and E were explicitly used to find relevant research and literature for the core cluster.</p> <ul style="list-style-type: none"> A) Databases & Indexes ERIC - Education Resources Information Centre, JSTOR, DAAI, Art Full Text by EBSCOHost, ACHI, Proquest Dissertations and Theses (PQDT) B) The Hong Kong Polytechnic Library C) Google Scholar D) Open Access Theses and Dissertations: OATD E) CORE (core.ac.uk)

Table 87. Data Sources for The Literature Review

Description	Type	Access through
ACHI Arts & Humanities Citation Index is part of the Web of Science collection and includes design journals.	Index	the Hong Kong Polytechnic University Library
Art Full Text by EBSCOHost is a database that covers various design disciplines such as industrial and interior design despite focusing on art literature.	Database	the Hong Kong Polytechnic University Library
CORE is a search engine (provided by the UK Open University and Jisc) that indexes open access articles immediately available to download. It gives access to a vast and enormous pool of freely accessible documents.	Search Engine	https://core.ac.uk/
DAAI , the Design and Applied Arts Index provides access to journal articles related to design, crafts, and applied arts.	Index	the Hong Kong Polytechnic University Library
ERIC , the Education Resources Information Center is an open-access library with education research. The United States Department of Education sponsors it.	Digital Library	https://eric.ed.gov/
Google Scholar is a search engine that indexes academic literature that can be found over the internet. At this search engine indexes the vast internet, it may occasionally display non-fiction, non-scholarly literature, which contradicts the service's name. Nonetheless, it helps discover published what has been published if used carefully.	Search Engine	http://scholar.google.com/
The Hong Kong Polytechnic Library , or Pao Yue-kong Library, has an extensive collection of methodology books and classic, non-digitised creativity literature published decades ago. They also have subscriptions to numerous journals and databases.	University Library	https://www.lib.polyu.edu.hk/
Internet Archive is an American digital library with more than 4 million publicly accessible books, many of which are classic manuscripts that set the foundation of creativity research.	Digital Library	https://archive.org/
JSTOR , also known as Journal Storage, contains digitised back issues of academic journals which are very useful for gaining a historical perspective.	Digital Library	https://www.jstor.org/
OATD , also known as Open Access Theses and Dissertations, is a search engine that indexes open access graduate theses and doctoral dissertations worldwide.	Search Engine	https://oatd.org/
Proquest Dissertations and Theses (PQDT) contains many dissertations from the United States.	Database	the Hong Kong Polytechnic University Library

Appendix 13 – Personality Traits

Table 88. Thematic analysis phases

<i>Step</i>	<i>Phase</i>	<i>Description</i>
<i>1</i>	<i>Familiarise with the data</i>	<i>Transcribing if necessary. Read the data multiple times, noting initial ideas.</i>
<i>2</i>	<i>Generating initial codes</i>	<i>Coding notable and interesting captions, relating, and collating data that is relevant to each code</i>
<i>3</i>	<i>Search for themes</i>	<i>Generating a thematic 'map' of the analysis</i>
<i>4</i>	<i>Reviewing the themes</i>	<i>Reviewing the specifics for each theme</i>
<i>5</i>	<i>Defining and naming themes</i>	<i>Refining the specifics of each theme and generating clear definitions and names for each theme</i>
<i>6</i>	<i>Producing a report</i>	<i>Selection of vivid and compelling quotations from the transcripts. Relating them to the research question being studied and producing a scholarly report.</i>

Appendix 14 – Search Strategies

Upon investigating Google Scholar through the software PUBLISH OR PERISH, I had not found any evidence of published material with the topic raised above. Multiple searches were conducted as early as January 2018 onwards. Google Scholar, by default, searches on both indexed publication titles and indexed abstracts. Searching only at publication titles on Google Scholar was not possible at the time of writing. Nonetheless, it is possible to search titles through Publish or Perish. It is free and powerful software that can retrieve and analyse academic citations.

Searching at publication titles for [“DESIGN EDUCATION” “IDEA GENERATION” “TEACHING STRATEGIES”] yielded no results (0 results). Changing “TEACHING STRATEGIES” to “TEACHING METHODS” also yielded nothing (0 results). When searching with the abstracts included 207 and 493 results were yielded, respectively, a combined total of 700 results. Google Scholar provided 620 results (identical results were merged and counted as one - see [*Appendix 1 – Publication search list on page 268*](#)). From these results, only a few were remotely related to the topic. Only twelve contained the word “IDEATION”, and only three contained the phrase “IDEA GENERATION”. Nonetheless, all the results appear irrelevant, with only a handful being remotely related to this dissertation's theme but still off-topic.

A similar search was conducted at the Open Access Theses and Dissertations (oatd.org), a search engine that indexes dissertations worldwide. More details about all the search engines used are provided in [*Table 87 on page 331*](#). In summary, the results were also unfruitful. Considering Google Scholar is a popular, comprehensive indexing service, a 2018 study was assumed to have indexed 389 million documents (Gusenbauer, 2019), making it the largest database of its kind. Its database includes numerous literature sources, such as academic journals, books, conference papers, whitepapers, theses and dissertations, technical reports, patents, abstracts, legal manuscripts, and other documents.

An attempt was made to determine the most popular verb in conjunction with idea generation by examining the absolute count of the results on Google Scholar. Verbs that were looked upon included IMPROVING, FOSTERING, CULTIVATING, DEVELOPING, EXPANDING, EVOLVING, GROWING, and ENCOURAGING. Google scholar was selected for this attempt due to the extensive and comprehensive coverage across numerous publishers and publications. It has also been suggested that it has an index of 389 million articles (Gusenbauer, 2019) which means it is a potent research tool. Nonetheless, the actual results were not considered in this attempt. Instead, only the absolute figures were documented as an attempt to identify the most prevalent phraseology. The searches were performed on May 13th 2020, and are provided in Table 89 below.

Table 89. Common Verbs Used with Idea Generation and Creativity

	Idea Generation	Ideation	Creativity
-	83,900	470,000	3,040,00
<i>Improving</i>	132	80	2,830
<i>Encouraging</i>	126	61	11,700
<i>Fostering</i>	56	6	19,500
<i>Developing</i>	29	59	15,400
<i>Cultivating</i>	2	5	4,750
<i>Evolving</i>	6	5	439
<i>Growing</i>	0	4	386
<i>Expanding</i>	3	5	303
<i>Advancing</i>	1	2	279

Figures based on hits by Google Scholar, May 13th 2020,

This study looks at idea generation and not ideation. Some scholars may have been using both terms interchangeably. However, these terms differ in meaning, as *idea generation* is one of the two phases that occur in *ideation*. The other phase is idea evaluation. The idea generation phase aims to produce a high volume of ideas, whereas the idea evaluation phase aims at discarding the low quality ideas and selecting the best quality ideas. (Explained in more detail at section 5.5 on page 33).

The difference between these two terms is significant, especially when attempting to identify the most popular terms. As such, even though ‘ideation’ and ‘idea generation’ are not the same, the investigation to identify popular terms did include a searching ‘ideation’ as well. Creativity was also included, as it is the “parent” of idea generation, and it is semantically relevant.

The absolute figures provide a rough estimate of how broad and well covered the topic is. When the figures of “idea generation” are compared with creativity, idea generation seems minuscule, which can be considered perhaps an indicator or a not well established yet research area. This attempt concludes that multiple verbs have been used when searching for relevant literature, and there is no dominant term. Scholars and academics use improving and encouraging to indicate the growth of the ability to generate ideas. They also use fostering, and a few of them have used developing And a few other terms.

As this attempt failed to identify a dominant verb, the verbs cultivating, evolving, growing, expanding, and advancing were eliminated from further searches in databases and libraries. The remaining verbs, improving, encouraging, fostering, and developing, have been selected. It worth acknowledging the exact meaning of these words as they all refer to the growth of the ability to generate ideas, but each carries its specific meaning.

Upon looking at the OAL Dictionary⁴⁴ and comparing side by side (as shown in Table 90 on page 336) the relationship between the selected verbs becomes visible.

⁴⁴ 10th edition, Hornby, Albert S., Diana Lea, and Jennifer Bradbery. *Oxford Advanced Learner's Dictionary of current English*. Oxford: Oxford University Press, 2020. App.

Table 90. Meaning of Developing, Encouraging, Fostering, And Improving

<i>Developing</i>	<i>To gradually grow and become better and stronger</i>
<i>Encouraging</i>	<i>To provide support and courage</i>
<i>Fostering</i>	<i>To encourage something to develop</i>
<i>Improving</i>	<i>To become better than before</i>

Fostering embeds two of the selected verbs, developing and encouraging, and improving, adds the dimension of time, as it refers to a previous state. Developing also relies indirectly on the concept of time, as it deals with a gradual progression that occurs over time. Regardless of these nuanced differences, all the selected words address the growth of idea generation skill. All have been used to search for relevant literature, in conjunction with “idea generation”.

The search was conducted in stages; more specifically, the most significant search has been about discovering what has been written on idea generation on design education or design school. Then further searches were conducted with the verbs mentioned above to discover appropriate literature. Also, other relevant searches were performed.

Table 91 on page 337, is provided for your reference, and it shows the main keywords that were deployed (organised by their significance). Please note that the table is not complete in terms of keywords, as there have been multiple variations to adapt the various search engine algorithms from the various data sources. That means more keywords (including negative keywords) were used in the literature search. For example, a negative keyword used included the word “children” to eliminate a large volume of literature that does not refer to adult or higher education.

Table 91. Search Terms That Were Deployed

<i>Most significant</i>	"Idea generation" AND "Design education."
	"Idea generation" AND "Design school."
<i>Significant</i>	"improving idea generation."
	"encouraging idea generation."
	"fostering idea generation."
	"developing idea generation."
<i>Less significant but relevant nonetheless</i>	"assessing creativity."
	"improving creativity" AND "design."
	"encouraging creativity" AND "design."
	"fostering creativity" AND "design."
	"developing creativity" AND "design."

Appendix 15 – Constructivist Approaches

Table 92. Constructivist approaches (listed alphabetically)

<i>Cognitive constructivism</i>	learning and knowing is approached from an individual's perspective and focuses on the cognitive processes of the individual (Kridel, 2010, p. 536)
<i>Contextual constructivism</i>	It is about understanding the underlying culturally based beliefs that come to class from both students and teachers and how they are backed by culture. Contextual constructivism outgrew naturally out of personal constructivism (Cobern, 1991).
<i>Critical constructivism</i>	Critical constructivism is an approach that takes into consideration the social and cultural environment. It has a critical dimension intended at improving these environments in order to improve the effectiveness of constructivism. (Dougiamas, 1998)
<i>Cultural constructivism</i>	It is an approach of constructivism that takes into account and acknowledges that people from different cultural contexts can create different meanings of the same experiences (Hutchison, 2006)
<i>Dialectical constructivism</i>	It claims that knowledge comes from the interactions that people have with their environment (Schunk, 2020, p. 317)
<i>Endogenous constructivism</i>	It claims that knowledge comes from previously acquired knowledge and not from interacting with the environment (Schunk, 2020, p. 317)
<i>Exogenous constructivism</i>	The reconstruction of the external world results in the acquisition of knowledge (Schunk, 2020, p. 317)
<i>Individual constructivism</i>	It is an approach to delineate the processes through which people know things (Sharma et al., 2005, p. 22)
<i>Personal constructivism</i>	learners construct personally meaningful knowledge (Cobern, 1991)
<i>Radical constructivism</i>	As individuals adapt to their subjective experience, they construct knowledge (Sharma et al., 2005).
<i>Social constructivism</i>	It supports schools of thought that emphasise interacting and having social contact (Pritchard, 2010, p. 19). Knowledge is considered local, and reality comprises individual experiences. The meaning of reality is co-constructed within the community. (Rossman et al., 2010, p. 508)

Appendix 16 – Temporal change in Design Education and Design School Keywords

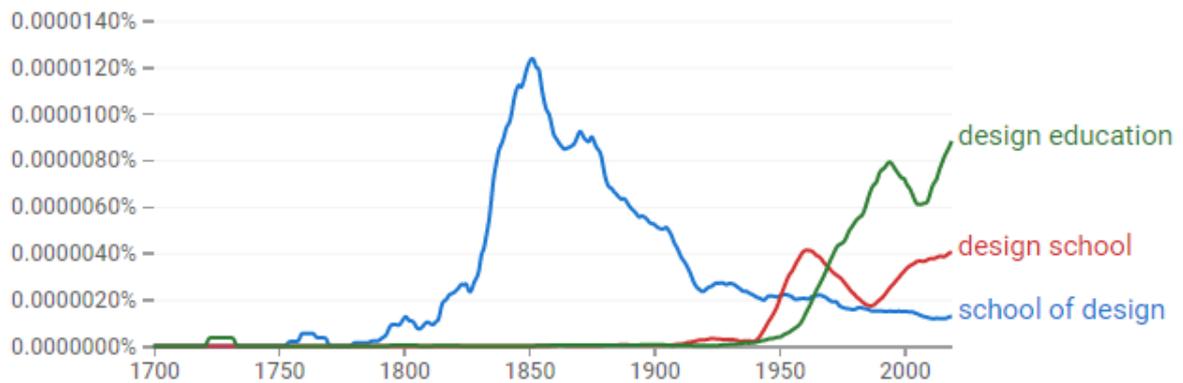


Figure 23. Google Ngrams. 'design education', 'design school', and 'school of design'. 1700-2019, 'English (2019)' corpus.

Appendix 17 – Creativity Approaches

Table 93. Definitions of Creativity, adopted from (Dow, 2017, p. 17)

<i>Creativity is...</i>	<i>Author & year</i>
<i>reorganising elements that can result in the correct solution or the sudden insight of knowledge.</i>	<i>(Köhler, 1929)</i>
<i>a process of thinking through preparation, incubation, illumination, and verification that provides results.</i>	<i>(Wallas, 1976)</i>
<i>consist of ideas that are very flexible, fluent, and novel</i>	<i>(J. P. Guilford, 1950)</i>
<i>a novel product or idea that is valuable to society</i>	<i>(Stein, 1953)</i>
<i>a surprising idea</i>	<i>(Bruner, 1962)</i>
<i>forming new associations or novel combinations of ideas</i>	<i>(Mednick, 1962)</i>
<i>useful and novel ideas or products</i>	<i>(A. J. Cropley, 1967)</i>
<i>producing ideas that are appropriate and original to realise a goal</i>	<i>(Amabile, 1983)</i>
<i>A novel idea that does transform the field</i>	<i>(Feldman, 1994)</i>
<i>valuable and novel ideas from intrinsically motivated people who have expertise in their field</i>	<i>(Amabile, 1996)</i>
<i>valuable and novel ideas that are occurring in specific environments</i>	<i>(Sternberg, 2002)</i>
<i>Interaction among process, aptitude, and environment in which someone produces a product or helpful idea and novel is defined within the social context created.</i>	<i>(Plucker et al., 2004)</i>
<i>Useful, high-quality novel ideas or products</i>	<i>(Beghetto & Kaufman, 2007)</i>

1. **Teresa M. Amabile** considers creativity to consist of three components, domain-relevant skills (such as technical skills and knowledge on the domain), creativity-relevant skills (such as thinking styles and personality traits), as well as task motivation (which involves a desire or interest toward given tasks)
2. **Richard L. Florida**, a world-renowned urbanist, has adopted the definition of Dean Keith Simonton's creativity. Creativity lies in the conjunction of novelty, surprise, and usefulness (2012, p. 6). Florida has been looking at creativity as an invaluable, precious resource that humanity cannot afford to let go to waste (and should be exploited in any sector of the economy) (2012, p. 388).
3. **Howard Gardner**. According to Gardner, a creative individual is a person who consistently works out problems or defines new questions in a way that in the beginning is considered new, but that eventually their solution becomes accepted.
4. **J. P. Guilford** claimed that our intuitive understanding of creativity entails idea generation (J. P. Guilford, 1950). In his Structure of Intellect model, he initially suggested 120 different possible mental were later increased to 180 abilities. According to this model, intelligence is viewed as operations, contents, and products. One of the operations in this model was divergent thinking, which Guilford associated with creativity. Guilford's work on divergent thinking set the foundation of what became later a popular measure of creativity, the Torrance Tests of Creative Thinking (TTTC) (Kaufman, 2009, p. 15).

5. **James C. Kaufman** and **Ronald A. Beghetto** proposed a model; the Four C Model represents the developmental curve of creativity on individuals. The four Cs are 'mini-c' which refers to the fact that creativity is inherent in learning. For example, when youngsters explore the world, they may be creating, but their creations are not revolutionary or ground-breaking. Nonetheless, they are meaningful to their creators. 'Little-c' reflects growth from the mini-c level, producing creations that might be meaningful and useful to others. 'Pro-c' is a higher realm of creativity in which individuals are professionally creating artefacts and ideas that are useful to others and typically have been through many years of training and deliberate practice.

The highest realm, the 'Big-C' creativity, is work produced by individuals that had an enormous impact globally and typically referred to a whole body of work, not just an idea. Big-C creatives are the types of people who will be remembered in history books.

6. **Abraham Maslow** is famous for his theory of motivation, also known as the pyramid of the hierarchy of needs (*Figure 24, page 343*). Maslow suggested that creativity coincides with self-actualisation. Confidence in creativity and lack of fear of ridicule are essential aspects of 'self-actualising creativeness' (Maslow, 1976, p. 85)

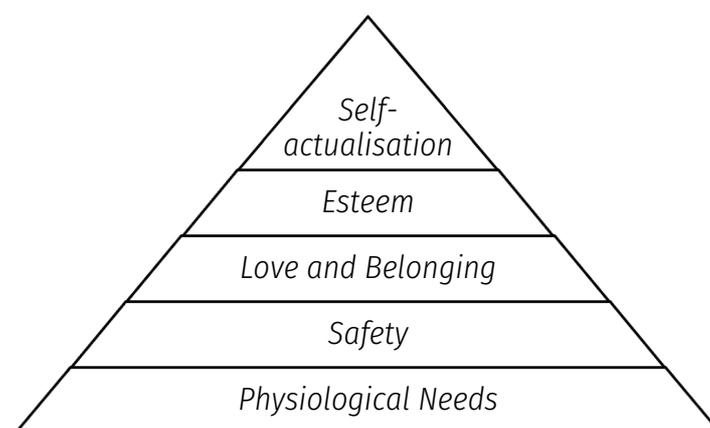


Figure 24. Maslow's hierarchy of needs

7. **Jonathan Plucker** offers this definition for creativity "the interaction among aptitude, process, and the environment by which an individual or group produces a perceptible product that is both novel and useful as defined within a social context" (Dow, 2017, p. 16).
8. **Mel Rhodes** attempted to synthesise many definitions of creativity and proposed four factors vital in the numerous approaches to defining creativity (Rhodes, 1961). These are *a person* (characteristics of traits of creative people), *process* (elements that affect creativity such as motivation, learning, thinking, perception and communicating), *product* (converting ideas into a tangible form), *press* (the relationship between humans and the environment).
9. **Daniel L. Rubenson** and **Mark A. Runco** (1992) proposed an economic-based approach to creativity. They argued that "*the pursuit of creativity is based on consideration of costs (including psychic and temporal) and the expected benefits.*"
10. **Robert J. Sternberg** and **Todd I. Lubart** (1996) suggested another economic-based theory, an "investment" theory of ideas. According to this theory, creative individuals operate like successful stockbrokers. When creatives pursue ideas, they are 'buying low' on ideas, which means their potential success is unknown. When creatives persist and continue working on their ideas, they will eventually *sell high* and then move on to another idea.
11. **E. Paul Torrance** argued that creativity is open-ended, infinite and with no end (1972, p. vii). He defined creative thinking as the process of seeing missing elements or gaps. Creativity is about constructing ideas or hypotheses concerning the missing elements or gaps, testing out these

hypotheses, and then communicating the outcomes, perhaps revising and rechecking the hypotheses (1962, p. 16).

Appendix 18 – Divergent Thinking

Hyperspaces

Table 94. Divergent thinking hyperspace categories (Runco & Acar, 2019, p. 232)

<i>Dimensions</i>	<i>Focus</i>	<i>Description</i>
<i>Originality vs conventionality</i>	<i>Description</i>	<i>Even though originality is key to creative thinking, creative thinkers utilise evaluative and convergent thinking processes.</i>
<i>Amoral, unethical, illegal, versus moral, ethical, legal</i>	<i>Construction</i>	<i>Many people can generate constructive and appropriate ideas, but creative people can consider destructive options too. The “dark” ideas can help expand the ideational capacity and resulting in more options</i>
<i>Taboo vs nontaboo</i>	<i>Social approval</i>	<i>Creative people can produce additional ideas because they do not restrict themselves to ideas that are acceptable or socially appropriate</i>
<i>Primary vs secondary processes</i>	<i>Consciousness</i>	<i>Creative people shine in balancing unconscious (primary) and conscious (secondary) processes.</i>
<i>Experience vs nonexperience</i>	<i>Memory</i>	<i>Creative people take advantage of their past experiences, and they also use their imagination effectively to surpass these past experiences.</i>
<i>Functional & practical versus impractical & aesthetic</i>	<i>Practicality</i>	<i>Superb creativity can be accomplished by emphasizing practicality or functionality and aesthetics.</i>
<i>Synthetic vs non-synthetic</i>	<i>Complexity</i>	<i>Creativity is usually found in simple ideas and expands further when combining and synthesizing solutions.</i>
<i>Breadth vs depth</i>	<i>Nature of the sequentially</i>	<i>Ideational productivity can gain from using many different categories for ideas and focusing on a few or a single category to generate more ideas.</i>
<i>Feasible, realistic, & possible versus infeasible, hypothetical, & unrealistic</i>	<i>Workability</i>	<i>Creative people consider further possibilities that are not yet confirmed. Viable solutions do not restrict them under current circumstances.</i>
<i>Natural vs unnatural</i>	<i>Objects</i>	<i>Creative people consider natural and unnatural or human-made things as sources for environmental cues in their creative thinking.</i>
<i>Humorous versus serious and sober</i>	<i>Solemnity</i>	<i>Creative people can discover humour even in severe work cases, and they do so without being impertinent.</i>
<i>Playful & childlike versus mature & responsible</i>	<i>Mindset</i>	<i>Creative people can combine a childlike, naïve perspective with maturity from an adult’s perspective.</i>
<i>Close vs remote</i>	<i>Distance in associations</i>	<i>Creative people can identify connections among related things. They do so differently from many others, making remote associations and connections among seemingly unrelated and irrelevant things.</i>

Appendix 19 – List of Institutions

The list below shows the undergraduate design programs that confirmed the inclusion of the universities in the survey samples. The only exclusion is RCA, which design being at master level, is considered the world best design school and it is very prestigious.

Table 95. Population sample – Institutions selected

Bachelor's Programme in Design	Aalto University	Finland
BFA in Graphic Design BFA in Interaction Design	California College of the Arts	United States
BFA in Graphic Design	California Institute of the Arts	United States
Interaction Design Communication Design	Emily Carr University of Art + Design	Canada
Communication Design Design Innovation & Interaction Design	The Glasgow School of Art	United Kingdom
BA (Hons) Design BA (Hons) Graphic Design	Loughborough University	United Kingdom
BFA in Design Art	Nanyang Technological University, Singapore (NTU)	Singapore
BA in Science with Second Majors in Innovation & Design	National University of Singapore (NUS)	Singapore
Communication Design (BFA) Design and Technology (BFA)	Parsons School of Design at The New School	United States
Undergraduate Communications Design	Pratt Institute	United States
BFA in Graphic Design	Rhode Island School of Design (RISD)	United States
MA in Visual Communication	Royal College of Art (RCA)	United Kingdom
Bachelor education in design	The Royal Danish Academy of Fine Arts	Denmark
BFA Design	School of Visual Arts (SVA)	United States
BFA programme in industrial design	Umea University	Sweden
Bachelor of Design	The University of Melbourne	Australia
Bachelor of Design in Visual Communication Bachelor of Design (Honours)	University of Technology Sydney	Australia
BA (Hons) Graphic Communication Design BA (Hons) Graphic and Media Design BA (Hons) Graphic Design BA (Hons) Interaction Design Arts BA (Hons) Graphic Design Communication BA (Hons) Graphic Branding and Identity BA (Hons) User Experience Design	University of the Arts London	United Kingdom

Appendix 20 – Resume

May 2022 – For the latest resume please visit

<https://www.linkedin.com/in/oustamanolakis>

ORCID - 0000-0002-2993-6545

Work Experience	Lecturer in Design and User Experience <i>Manchester Metropolitan University</i>	12/2020 – Present
	Adjunct Lecturer in Graphic Design <i>Hong Kong Baptist University</i>	09/2020 – 01-2021
	Researcher & PhD Candidate <i>The Hong Kong Polytechnic University</i>	09/2017 – Present
	Teaching Assistant <i>The Hong Kong Polytechnic University</i>	01/2018 – 08-2020
	Managing Director / Design Manager / UX Design Consultant <i>Giraffe Limited Hong Kong</i>	10/2013 – 06/2017
	Senior Graphic Designer <i>Self-employed</i>	09/2004 – 06/2017

Educational Background	PhD in Design Education <i>the Hong Kong Polytechnic University, Hong Kong</i>	2017 – 2022
	Postgraduate Certificate in Learning and Teaching in Higher Education <i>Manchester Metropolitan University, England</i>	2021
	MFA in Business Design Exchange <i>Gothenburg University, Sweden</i> <i>Tongji University, Shanghai, China</i>	2011 – 2013
	MFA in Design <i>Sandberg Institute, the Netherlands</i>	2008 –2010
	BA in Graphic Design Exchange <i>University of West Attica, Greece</i> <i>Metropolia University of Applied Sciences, Finland</i> <i>Gerrit Rietveld Academy, the Netherlands</i>	2002 –2007

Appendix 21 – Research activity

Oustamanolakis, M. (2020). A Study on the Factors That Contribute to the Growth of Idea Generation Ability in Design Education. 2020 International Conference on Open and Innovative Education Proceedings, p. 222–230. ISBN:978-988-8439-67-6

Oustamanolakis, M. (2020). Personality Traits of Creative People. PolyU Design Degree Show 2020, Hong Kong. <https://doi.org/10.13140/RG.2.2.13613.92641>

Oustamanolakis, M. (2020). Academic Terms and Research Methods: A Comprehensive List. PolyU Design Degree Show 2020, Hong Kong. <https://doi.org/10.13140/RG.2.2.23680.25604>

Oustamanolakis, M. (2019). (Working Paper) Ideation in Design Education. In: 18th NORDCODE SEMINAR, 1st IDBM Creative Research Symposium. Helsinki, Finland.

Oustamanolakis, M. (2019). Why there is no “Design heritage” but there is “designing heritage. BASE Design and Innovation (4), p.160-167. <https://repositorio.udd.cl/handle/11447/2646>

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Appendix 22 – Researchers’ Background

Biographical notes with the researchers' background

1. **West Attica University**, formerly known as Technological Educational Institute of Athens. Located in Athens, Greece. I did a bachelor’s in graphic design at this University. Greece has a tradition in philosophy that is deeply rooted in the education offered in the country. Debates through dialogic practise, rhetoric and ethics, and argument building are at the core of Greek education, in more or less in all levels of education. In a sense, it is a philosophical approach in design by using the Socratic method (also described as critical conversations in this dissertation, see section 8.2.2 on page 171).
2. **Metropolia University of Applied Sciences**, formerly known as EVTEK University of Applied Sciences. It is in Helsinki and Vantaa, Finland. I did exchange studies at the graphic design department for one academic term, half-year. The program had a curriculum similar to my program in Athens, almost identical. However, the teaching approach relied much more on hands-on assignments, working with tools, and learning how to become a professional designer.
3. **Gerrit Rietveld Academy**, graphic design department. It is in Amsterdam, the Netherlands. I did exchange studies for one academic term, half-year. Gerrit Rietveld Academy is (an art school) deeply rooted in the de Stijl art movement, also known as “neoplasticism”. Their approach to design relies more on de Stijl art education (emphasising pure abstraction and universality towards colours, forms, shapes, and materials) rather than preparing professionals for the design industry.

4. **Sandberg Institute**, Design department. This an MFA in Design. Located in Amsterdam, the Netherlands. Sandberg institute is affiliated with Gerrit Rietveld Academy, and as such, it loosely follows a similar pedagogical approach. Nonetheless, it promotes learners working autonomously, and the curriculum is flexibly adapting depending on the learner needs. Overall, it is an institution that promotes critical thinking while relying heavily on current issues as a pedagogical platform.

5. **Gothenburg University**, in Gothenburg, Sweden. This program is an MFA in Business Design. The program is co-hosted with the HDK-Valand - Academy of Art and Design (formerly known as HDK School of Design and Crafts) and the Handels School of Business, Economics and Law of Gothenburg University. Half of the cohort had a business background and business experience, and the other half had design experience and design background. Learners were split into mixed groups and had to solve real-world issues from the local community and region by utilising the team's expertise.

6. **Tongji University**, College of Design and Innovation. Located in Shanghai, China. I did one-year exchange studies here through my MFA in Business Design program. Technically, it was half-year exchange studies and half-year pursuing my MFA thesis with the assistance and supervision of Tongji University. Part of my education there was organised by a Sino-Finnish initiative titled Aalto-Tongji Design Factory. My experience in this environment was completely different from any other institution that I attended before. Following a similar cross-disciplinary logic with the MFA in Business Design, this school added engineers in the mix, next to business majors and designers, while being connected with industry workshops and real-world factories located nearby. Simultaneously, while most of the learners were Chinese, the exchange students' diversity was spanning with people who originated across a vast range of countries and continents.

