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DOKTOREGO TESIA

Exploring the impact of Design Thinking on Higher Education students´ Creative Self-Efficacy

Design Thinkingaren Eragina Aztertzen Unibertsitate Ikasleen Auto-eraginkortasun Sortzailean

BEÑAT FLORES PUGA // Aretxabaleta, 2020

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LABURPENA / *ABSTRACT* / RESUMEN

Egungo hezkuntza sistemak dituen erronka garrantzitsuenen artean dago ikasleen sormenaren sustapena, gizartearen erronka globalei erantzun sortzaile zein berritzaileak emateko prestatuz. Hori dela eta, doktore-tesi honek auto-eraginkortasun sortzailearen (creative self-efficacy) alderdi garrantzitsuenak jorratu ditu, hiru atal desberdinetan banatuta: 1) Teorikoa, 2) Metodologikoa, eta 3) Aplikatua. Lehenik eta behin, ikerketa honetan sormenari, auto-eraginkortasun sortzaileari eta Design Thinkingari buruzko literaturaren berrikuspena aurkeztuko da, arreta berezia jarriz goi-mailako ikasleen auto-eraginkortasun sortzailearen garapenari begira duen potentzialtasunean (Atal Teorikoa). Bigarrenik, "Creative Self-Efficacy Inventory" (CSEI) tresna gaztelaniara egokitu eta berau baliozkotu da (CSEI-S), unibertsitateko ikasleen auto-eraginkortasun sortzailea modu fidagarrian neurtu ahal izateko. Hirugarrenik, "Ikus-entzunezko Formatu eta Eduki Berriak" esku-hartze programaren diseinua aurkeztuko da, berau Mondragon Unibertsitateko Ikus-entzunezko Komunikazioa graduko 4. mailan nola inplementatu zen deskribatzeaz batera. Programa hori Design Thinkingaren faseetan oinarrituz diseinatu zen eta ikasleen auto-eraginkortasun sortzailean eraginik ote duen ebaluatu du tesi honek (Atal Aplikatua). Azkenik, atal bakoitzeko ekarpen, muga eta etorkizunerako lan-ildoak laburbildu dira.

Hitz-gakoak: Sormena; Auto-eraginkortasuna; Design Thinking; Goi-mailako ikasketak; Ebaluazio tresna; Esku-hartze programa.

The implementation of programs aimed at helping students to promote their creativity is a key goal for education systems in their mission to train students to interact with a society whose global challenges require creativity and innovation. This dissertation addresses relevant aspects in relation to creative self-efficacy and is divided into three sections: 1) Theoretical, 2) Methodological, and 3) Empirical. First, it provides a review of the literature with regard to creativity, creative self-efficacy, and Design Thinking, focusing on the potential of the Design Thinking process for developing student creative self-efficacy in Higher Education. Second, it adapts the Creative Self-Efficacy Inventory (CSEI) to the Spanish language (the CSEI-S) and validates its capacity to reliably assess in Spanish student creative self-efficacy in Higher Education (Methodological Part).

Thirdly, it presents the design, implementation and evaluation of the Design Thinking-based educational program named “Innovative Audiovisual Contents and Formats” (IACF); such evaluation has been measured using the CSEI-S in order to report changes by fourth year Communication Studies undergraduates at Mondragon University in their creative self-efficacy levels (Empirical Part). Finally, this doctoral thesis concludes by summarizing the contributions, limitations, and future lines of work of each of the three areas covered.

Keywords: Creativity; Self-efficacy; Design Thinking; Higher Education; Instrument; Intervention program.

El sistema educativo actual cuenta entre sus mayores retos con la implementación de programas destinados al fomento de la creatividad de sus alumnos, con el fin capacitarlos para una sociedad cuyos retos globales requieren de creatividad e innovación. Por ello, esta tesis doctoral aborda áreas relevantes en el estudio de la Autoeficacia Creativa (creative self-efficacy), y está dividida en tres secciones principales: 1) Teórica, 2) Metodológica, y 3) Aplicada. En primer lugar, proporciona una revisión de la literatura sobre la creatividad, la autoeficacia creativa y el pensamiento de diseño (Design Thinking), especialmente enfocado a explorar el potencial del Design Thinking en el desarrollo de la autoeficacia creativa en el alumnado de enseñanza superior (Parte Teórica). En segundo lugar, se lleva a cabo la adaptación al español y validación del “Creative Self-Efficacy Inventory” (CSEI) dando lugar al CSEI-S, un instrumento multidimensional apto para la evaluación de la autoeficacia creativa de estudiantes universitarios (Parte Metodológica). En tercer lugar, se describe el diseño, implementación y evaluación del programa educativo basado en Design Thinking "Contenidos y Formatos Audiovisuales Innovadores" (IACF), evaluación llevada a cabo mediante la medición de autoeficacia creativa de los estudiantes de cuarto curso Comunicación Audiovisual de Mondragon Unibertsitatea (Parte Aplicada). Finalmente, esta tesis doctoral concluye ofreciendo un resumen de las fortalezas, limitaciones y futuras líneas de trabajo de cada sección.

Palabras Clave: Creatividad; Autoeficacia; Pensamiento de Diseño; Enseñanza Superior; Instrumento; Programa educativo.

TABLE OF CONTENTS

AURKIBIDEA

INTRODUCTION 13

Background of the study 13

Personal and Research Trajectory 15

Interest and Purposes of the Dissertation 18

Structure of the Dissertation 20

PART ONE: Theoretical Background 22

Chapter 1: Embedding Creativity in Higher Education 23

1.1. Understanding Creativity 24

1.2. Creativity Conceptions in Education 26

1.3. The Need for Creativity in Higher Education 27

Summary and Conclusions of the First Chapter 29

Chapter 2: From Creativity to Creative Self-Efficacy 30

The Creative Self 31

2.1. Creative Self-Efficacy 31

2.1.1. Current Conceptualization of Creative Self-Efficacy 32

2.2. Sources Influencing Creative Self-Efficacy 34

2.2.1. Internal Sources of Creative-Self-efficacy 34

2.2.2. Contextual Sources of Creative Self-Efficacy 37

2.3. Creative Self-Efficacy in Higher Education 40

Summary and Conclusions of the Second Chapter 45

Chapter 3: Design Thinking as an Educational Approach to Promote Student Creative Self-Efficacy 46

Towards Creative Learning and Innovative Pedagogies in Higher Education 47

3.1. Design-Based Pedagogy as a Creativity-fostering Educational Approach 47

3.1.1. Design-Based Pedagogy (DBP) 48

3.2. The Design Thinking Process 49

3.2.1. D.School's Design Thinking model 53

3.3. Design Thinking in Educational Contexts 57
3.4. Bridging Design Thinking and the Sources of Self-Efficacy 61
3.4.1. Enactive mastery experience 62
3.4.2. Vicarious experience 63
3.4.3. Verbal (or social) persuasion 64
3.4.4. Psychological and affective states 65
Summary and Conclusions of the Third Chapter 67
PART TWO: Methodological Part 69
Chapter 4: A Spanish Version of the Creative Self-Efficacy Inventory (the CSEI-S) 70
Introduction 71
4.1. The Dimensionality and Assessment of Creative Self-Efficacy 73
4.2. The relationship of Creative Self-Efficacy with Cognition, Personality, and Gender 76
4.3. Method 79
4.3.1. Participants 79
4.3.2. Instruments 80
4.3.3. Procedure 82
4.3.4. Data Analysis 84
4.4. Results 86
4.4.1. Dimensional Structure 86
4.4.2. Reliability 88
4.4.3. Association of CSEI-S dimensions with one-dimensional Creative Self-Efficacy, Emotional Divergent-Convergent Thinking, Need for Cognition, and Personality 88
4.4.4. Differences in Creative Self-Efficacy across Gender Groups 90
Summary and Conclusions of the Fourth Chapter 92
Limitations of the Study and Future Research 93

PART THREE: Empirical Part 95

Chapter 5: Design, Implementation and Evaluation of the IACF Intervention Program 96

Introduction 97

5.1. Assessment of the Influence of Design Thinking on Student Creativity 98

5.2. The 'Innovative Audiovisual Contents and Formats' (IACF) Intervention Program 100

5.2.1. Objectives of the IACF program 100

5.2.2. Structure and activities of the IACF program 101

5.3. Method 110

5.3.1. Participants 110

5.3.2. Research Design 111

5.3.3. Instruments 111

5.3.4. Procedure 113

5.3.5. Data analysis 115

5.4. Results 116

5.4.1. Differences in the pre-test and post-test scores of the experimental group regarding Tierney and Farmer's CSE, CSEI-S dimensions, and Need for Cognition (NC) 116

5.4.2. Differences between the experimental group and control group regarding Tierney and Farmer's CSE, CSEI-S dimensions, and Need for Cognition (NC) 117

5.4.3. Differences in Creative Self-Efficacy across Genders 119

5.4.4. Correlations between the dimensions of the CSEI-S and Team Satisfaction. 121

5.4.5. Student Satisfaction with the IACF intervention program 122

Summary and Conclusions of the Fifth Chapter 125

Limitations of the Study and Future Research 127

Final Considerations 130
Main Theoretical, Methodological, and Empirical Contributions 131
Theoretical Contributions 131
Methodological Contributions 132
Empirical Contributions 133
Limitations of the Study and Future Research 134
Theoretical Limitations and Future Research 134
Methodological Limitations and Future Research 134
Empirical Limitations and Future Research 135
General conclusion 136
References 138
Appendices 168
Appendix 1. The Creative Self-Efficacy Inventory-Spanish (CSEI-S). 169
Appendix 2. Fact sheets of the IACF Program Activities. 170

LIST OF TABLES

TAULEN AURKIBIDEA

Table 1. Characteristics of the Research Sample according to their Institution, Bachelor's Degree, and Gender 79

Table 2. Fit Indices for the CSEI-S of the Three Different Models Tested 87

Table 3. Reliability Indices of the CSEI-S 88

Table 4. Correlations between the Dimensions of the CSEI-S and those of Tierney and Farmer's CSE Scale, EDICOS, NC and EPQR-A 89

Table 5. Mean Differences between Females and Males in relation to CSEI-S Scores .91

Table 6. Activities and Goals of the IACF Intervention Program 104-106

Table 7. Visual Depiction of the Schedule of the IACF Program 108-109

Table 8. Characteristics of the Research Sample according to Group Condition, Institution, Academic Year, and Gender 110

Table 9. Distribution of the IACF Activities throughout the 15-week Program 116

Table 10. Mean Scores, Standard Deviations, and Student's *t* and Cohen's *d* Values Obtained During the Pre-test and Post-test Phases from Experimental Group Participants 114

Table 11. Mean Scores, Standard Deviations, and Results of the Analysis of Covariance of the Experimental and Control Groups at Pre-test and Post-test 118

Table 12. Mean Scores, Standard Deviations, and Student's *t*, *F* and Cohen's *d* Values for Males and Females Obtained during the Pre-test and Post-test Phases 120

Table 13. Pearson Correlations among the Dimensions of CSEI-S and the Team Satisfaction of the Participants from the Experimental Group 121

LIST OF FIGURES

IRUDIEN AURKIBIDEA

Figure 1. Classification of the Creative Self-Beliefs 33

Figure 2. Components of Innovation 51

Figure 3. d.school's Design Thinking Model 54

Figure 4. The Educational Design Ladder Pedagogy Model 60

Figure 5. Scores Provided by Students from the Experimental Group regarding their Satisfaction with the Facilitators Involved in the IACF Program 123

Figure 6. Scores Provided by Students from the Experimental Group regarding their Satisfaction with the Characteristics of the IACF Program 124

Introduction

INTRODUCTION

Background of the study

The European Council declared 2009 "European Year for Creativity", following recognition in spring 2008 that the development of creativity and innovation of European citizens was vital for future growth (Cachia et al., 2010). Since jobs are created when new products and services appear, creativity has been regarded as particularly important to the economy (Sternberg & Lubart, 1999). Hence, in this "Creative Society", success will be determined by the ability to think in a creative way, above knowledge acquisition (Resnick, 2008).

Stakeholders are now less interested in what undergraduate students "know", and focus more on what students are able to "do with what they know" (Watts & Blessinger, 2016:215). Indeed, many CEOs (Chief Executive Officer) are chosen according to the vision they have to transform their company (Sternberg & Lubart, 1999), to demonstrating the company's value and to encourage creativity (Puente-Díaz & Cavazos-Arroyo, 2017c). Whilst students are trained to solve specific problems, they often fail to adapt to the circumstances generated in this fast speed-changing world and to improvise accordingly (Resnick, 2008). Moreover, despite academic efficiency, students often struggle when they face challenges related to their personal or professional lives after graduating. It is therefore now generally believed that creativity is essential to and needs to be developed by future professionals (Chan & Yuen, 2014; Csikszentmihalyi, 2006 Mullet et al., 2016; Pecheanu & Tudorie, 2015).

Creativity needs to overcome safeness and stability so as to anticipate change and lead society in a worthwhile direction. Csikszentmihalyi (2006) predicts that failing to do so, will make it difficult (if not unlikely) for any nation or institution to survive this new changing scenario. Florida, Mellander and King (2015) provide solid evidence of countries worldwide whose Global Creative Indices (GCI) are correlated with a higher quality of life. This ranking measures the three dimensions (talent, technology, and tolerance) of advanced economic growth and prosperity, as well as each nation's creativity and prosperity levels. On ranking 139 countries all over the world, their study

concluded that nations scoring high on the GCI had higher levels of "economic output, entrepreneurship, economic competitiveness, and overall human development", in addition to lower levels of inequality (Florida, Mellander, & King, 2015:35).

Within this context, creativity and the "Creative Class" are key factors in innovation and economic growth, and are regarded as highly influential in society (Florida, 2014:xxi). According to the definition provided by Florida, the Creative Class refers to a group of professionals from different fields (e.g. engineering, design, education, arts, music, entertainment, business, finance, law, health-care etc.) whose function in the economy is the creation of new ideas, technologies, and content. The main difference from other classes is that people from the *Creative Class* are "paid to use their minds", in contrast to *Working Class* professionals, whose duties mainly involve routine and physical work (Florida, 2014:9). Creativity has thus become the "most highly prized commodity" (Florida, 2014:6) for managing change whilst maintaining standards and quality (Tosey, 2006) in the present-day economy.

Journalists and communication professionals are part of the previously mentioned Creative Class. Not only are such professions amongst the "most promising fields of economic activity" in highly developed economies, but they are also regarded as one of the most innovative sectors (Müller, Rammer, & Trüby, 2009:2). This might be owing to the fact that the Internet and the digital revolution have completely changed the communication and journalism paradigms (Chege Mwangi, 2011). However, there is a "culture-lag" concerning the demands of today's society and what education offers (Csikszentmihalyi, 2006:xix). In Spain, for instance, creativity is glaringly absent from the curriculums of third-level Communication Studies, as evidenced by The Spanish White Paper on Communication Degrees (Jiménez, 2007; Zuberogoitia, Arana, & Egaña, 2014).

Today's students live in a very different world to that of earlier generations, requiring them to develop a whole new skill set that includes "to learn to think creatively, plan systematically, analyze critically, work collaboratively, communicate clearly, design iteratively, and learn continuously" (Resnick, 2008:22). For this reason, future media professionals will need to face a constant recycling process (Shute & Becker, 2010) in

order to develop creativity, innovation and collaboration skills, as well as flexibility and problem-solving aptitudes (Giles & McCarty, 2016; Kochhar-Lindgren, 2016:60). For this reason, schools and universities need to embrace creativity, nurturing it from the earliest educational stages of education. By allowing Communication students to demonstrate and develop their creativity throughout their academic career, future professionals would be more prepared to face more effectively the global challenges emerging in this era of uncertainty (Zuberogoitia, Arana, & Bidegain, 2013).

Nonetheless, there is a risk of regarding creativity as a tool to contribute to a unidirectional economic development of a market-oriented and globalized world (Craft, 2006). For this reason, universities should not merely instruct in order to meet the needs of a more competitive market but should also provide students with the skills to contribute to society in some way (Stefani, 2016). An educational system that supports creativity is regarded to be crucial for enabling students to develop such an attribute, as part of the 21st century skill set. Thus, there is also a great opportunity for universities that teach Journalism and Communication Studies to embrace creativity (Gauntlett, 2015; Jiménez, 2007; Zuberogoitia, Arana, & Bidegain, 2013; Zuberogoitia, Arana, & Egaña, 2014) in order to better prepare students for the emerging professional world.

Personal and Research Trajectory

The starting point of the present Doctoral Thesis was the research carried out by the PhD candidate during the capstone project of his Master's degree (Flores, Egaña, & Zuberogoitia, 2016). The study in question described the emergence of "Goikolab", a media innovation laboratory set up at Mondragon University in Fall 2013 and which was inspired by the Design Thinking process. The goal of the laboratory was to inspire students in their fourth and final year of their undergraduate degree to provide tangible solutions for problems faced by real media companies and public broadcasting institutions (the Basque Public Broadcasting Company, a local multimedia group, the Basque Autonomous Government, and the Provincial Government). For such purposes, students in their third year received instruction on Design Thinking methodology and undertook a compulsory internship in a communication company to obtain practical insight. After doing so, once in the fourth year of their degree studies, a limited number

of students (nine) were selected and divided into three teams to join the laboratory in November 2013. Goikolab offered students a physical space equipped with flexible furniture and all the tools and technologies required to design and produce quality audiovisual products. After carrying out a content analysis of participants' daily learning, in addition to conducting several in-depth semi-structured interviews, the results revealed confusion regarding the definition of creativity amongst the participating students. Furthermore, students stressed the need for further training in Design Thinking for them and their mentors. Lastly, students' confidence in their creative abilities could not be tested, due to the absence of a reliable instrument.

Based on the preliminary results obtained in the pilot study, further research was carried out to refine the Goikolab experience and to evaluate subsequent editions. Consequently, Flores, Zuberogoitia, Belategi and Egaña (2018) reported three substantial changes introduced during the academic year 2016-2017. On the one hand, all fourth year Communication Studies students developed their end-of-degree projects in the laboratory (a total of 41 students, divided into 14 teams), in contrast to the nine students selected during the academic year 2013-2014. On the other hand, both students and their mentors participated in a Design Thinking course consisting of six training sessions in addition to follow-up guidance with two expert facilitators. Finally, in the spirit of Design Thinking, students were encouraged to experiment with their creativity in interdisciplinary teams, collaborating with students from the Entrepreneurial Leadership and Innovation degree at Mondragon University, as well as Master's degree students from the field of education.

For the data-gathering procedure, ten students and ten mentors were randomly selected to conduct focus group discussions. In addition to this, student teams were asked to produce a 1,000-word essay reflecting self-perceptions about their creative abilities after undergoing the Goikolab experience. The findings obtained from analyzing the content of the essays and the focus group discussions revealed mixed results regarding students' perceptions of their creativity. On the one hand, while some participants did not perceive themselves as more creative at the end of the process, others stated that Design Thinking helped them generate more creative solutions. On the other hand, both organizational and academic mentors were generally satisfied with the project outcomes provided by student teams but acknowledged problems with Design Thinking training. In

addition, when asked about student creativity, they expressed uncertainty. In line with previous research (Flores, Egaña, & Zuberogoitia, 2016), the study emphasized the existing confusion regarding the definition of creativity by both students and their mentors. More importantly, the study questioned the suitability of the Design Thinking process for developing a capstone project. More specifically, the rigid requirements of such an academic assignment (in terms of content, format, and schedule) did not seem to be compatible with the flexibility and freedom needed for exploring ambiguity in Design Thinking. Many students regarded the projects proposed by the external organizations as too narrowly defined and claimed that little room was left for being creative.

The aforementioned studies form the basis of this dissertation. Throughout this four-year process, there was an essential milestone for the achievement of the ultimate purpose of this work; namely the three-month research stay carried out by the PhD candidate at Stanford University's Center for Design Research (CDR) during Fall 2017. This academic stay allowed the candidate to review and refine the initial design of this thesis with various respected researchers from Stanford University (Larry Leifer, Rebecca Currano, Neeraj Sonalkar, Adam Royalty, Manish Saggar, Bernard Roth and Sheri Sheppard, amongst others) whose backgrounds include but are not limited to Design Thinking and the study of creativity in educational contexts. Amongst the many contributions, this research appointment prompted, on the one hand, the need for enabling students to experience the Design Thinking process free from the previously mentioned constraints of a capstone project. On the other hand, it evidenced the need for exploring the potential contribution of Design Thinking to student creative self-efficacy. These observations led to the setting up of the "Innovative Audiovisual Contents and Formats" intervention program (the IACF) at Mondragon University, a 15-week intervention program based on the Design Thinking process and aimed at fostering the creative self-efficacy of Communication Studies undergraduates.

Interest and Purposes of the Dissertation

This dissertation addresses three major gaps that are patent in the literature regarding assessment and training of creative self-efficacy in educational contexts. On the one hand, research has traditionally regarded creative self-efficacy as a one-dimensional construct and has mostly been measured using one-dimensional scales. In recent years different multidimensional instruments have been developed to measure individuals' perceptions of their creative abilities. Nonetheless, to date, there is no one reliable instrument to assess student creative self-efficacy in the Spanish language beyond a single dimension. At the same time, a variety of creativity training courses have been developed to enhance students' perceptions of their creative abilities. Amongst the variety of educational approaches, Design Thinking has the potential for helping undergraduates to achieve such an ideal. However, only a few studies have explored the potential benefits of the Design Thinking process in the creative self-efficacy of Higher Education students. Furthermore, to date, no research has been conducted in the academic domain of Communication Studies. Hence, this thesis was developed with three major goals in mind:

1. Firstly, it aims to provide a state-of-the-art review with regards to creativity, creative self-efficacy, and Design Thinking in educational contexts, focusing on the potential for developing student creative self-efficacy through the medium of Design Thinking in Higher Education.

2. Secondly, it aims to adapt the Creative Self-Efficacy Inventory (CSEI) to the Spanish language and validate it so as to create the CSEI-S, a multidimensional instrument aimed at reliably assessing student creative self-efficacy in Higher Education in the Spanish language.

3. Thirdly, it aims to describe the design and implementation of the Design Thinking-based educational program called "Innovative Audiovisual Contents and Formats" (IACF), and to evaluate it by means of changes in creative self-efficacy levels reported by fourth year Communication Studies undergraduates from Mondragon University.

This doctoral thesis contributes to the understanding of creativity through the examination of creative self-efficacy. For this purpose, it offers a complete multidimensional conceptualization of the construct, demonstrating that creative self-efficacy can be divided into seven different forms of self-efficacy. Likewise, this work contributes to the body of research on the implementation of the Design Thinking process in educational contexts. Previous investigation suggests that the tools and methods of Design Thinking influence the individual's beliefs of their creative capacity through the sources of self-efficacy. In this way, the present work sets out to prove whether there is any evidence to support the link between Design Thinking and creative self-efficacy.

The potential benefits of self-beliefs about creativity for student learning have favored a rapidly increasing interest in assessing student creative self-efficacy in educational contexts. However, a vast body of research has been conducted using one-dimensional scales for assessing perceived efficacy to perform creatively. Furthermore, to date, there is no reliable instrument to measure student creative self-efficacy in Spanish beyond a single dimension. Hence, this dissertation aims to make a methodological contribution by providing a valid instrument to reliably assess creative self-efficacy in Higher Education students from a multidimensional perspective, in the Spanish language.

Lastly, regarding Empirical contributions, this dissertation can offer researchers, educators, and Design Thinking practitioners the fundamental insights into the Design Thinking process. Furthermore, we provide an overview of the intervention program named "Innovative Audiovisual Contents and Formats" (IACF), designed for and implemented in Communication Studies, contributing to the expansion of the implementation of the Design Thinking process in a little explored academic domain. Hence, we evaluate the effectiveness of the proposed intervention program according to the creative self-efficacy levels of the undergraduates. The results obtained could help improve the program in order to make it implementable in similar academic areas in the future.

Structure of the Dissertation

This dissertation is organized in three major parts, which are divided into an introduction, five chapters, and final considerations.

PART ONE focuses on the first research purpose of the dissertation and constitutes the theoretical background of this work. It is divided into three chapters, according to the three main theoretical pillars of this dissertation. After an Introductory section, in which creativity is discussed as a crucial skill for future professionals, **Chapter One** provides a general conceptualization of creativity and evidences the need for Higher Education to embrace and promote student creativity. Switching the focus from creativity as a cognitive process to the creative self as an individual, **Chapter Two** introduces Creative Self-Efficacy as a relevant construct for education, and provides a review of its current conceptualization and the sources influencing it. At the end of the chapter, we explore the potential benefits of developing student creative self-efficacy through creativity-training programs by reviewing research into creative self-efficacy carried out within educational contexts. **Chapter Three** deals with Design-Based Pedagogy as an effective educational approach to develop creative self-efficacy in Higher Education and offers a full description of the Design Thinking process, including its main stages and foundational principles. The chapter continues by exploring the implementation of Design Thinking in education, and it connects each Design Thinking phase to the theory of self-efficacy. Finally, we report the most relevant university-based experiences found in the literature where Design Thinking has been used as an educational approach to undergraduates' creative self-efficacy.

PART TWO represents the methodological work carried out within the dissertation project, thus addressing the second research goal of this dissertation. **Chapter Four** describes the adaptation and validation process of the Creative Self-Efficacy Inventory-Spanish (CSEI-S). The chapter addresses the absence of multidimensional instruments for assessing creative self-efficacy in Spanish. For such purposes, it provides solid evidence of both internal and external validity of the instrument. Furthermore, we explore the association between the dimensions of creative self-efficacy with need for cognition and personality variables. Lastly, potential gender differences are examined

with regards to respondents' perceived efficacy of their ability to succeed in creative endeavors.

PART THREE addresses the third research purpose of the dissertation, and constitutes the empirical part of the work, which has been carried out in the Bachelor of Communication Studies, at Mondragon University. **Chapter Five** describes the design, implementation and evaluation of the Design Thinking-based intervention program called "Innovative Audiovisual Contents and Formats" (IACF). Hence, we use the previously adapted and validated CSEI-S to measure the creative self-efficacy levels of IACF participants. Throughout the chapter, we explore the effects of the intervention program on the different dimensions of creative self-efficacy, as well as on their Need for Cognition, Personality and Team Satisfaction.

To conclude, some final considerations are presented by way of a summary of the theoretical, methodological, and empirical contributions of the project. These contributions are followed by an acknowledgment of the theoretical, methodological, and empirical limitations encountered during this dissertation. Finally, the Appendices offer additional material relevant to the dissertation, such as the full version of the Creative Self-Efficacy Inventory-Spanish (CSEI-S) (Appendix 1), and the activities included in the IACF program (Appendix 2).

PART ONE

THEORETICAL BACKGROUND

CHAPTER 1

Embedding Creativity in Higher Education

In this first chapter, we will discuss the need for Higher Education to embrace creativity and allow students to develop this 21st century skill. The notion that creativity needs to be coherently defined and reflected in the curriculum is currently supported, though misconceptions in educational contexts threaten its development. This chapter offers an introductory explanation of what creativity is, how creativity is conceived in education, and the need for embedding creativity in Higher Education.

1.1. Understanding Creativity

The origin of creativity as a term is uncertain. Some argue that the earliest Western conception of creativity is biblical and goes back to Genesis, in which the story of Creation introduces the idea of artisans doing God's work on Earth (Albert & Runco, 1999). According to Albert & Runco, the word *create* appeared in written form for the first time in texts by Chaucer. Elsewhere, it is thought that the term *create* appeared for the first time in English in the 16th century, when artists used it in order to differentiate themselves from other craftsmen (Blessinger & Watts, 2016:4). This may explain why the word *creativity* is often related to the artistic fields, which require "inspiration, vision, spontaneity and imagination" (Blessinger & Watts, 2016:4). However, the notion of creativity is no longer limited to the artistic fields (Florida, 2014; Kelley & Kelley, 2013; Lucas, Claxton, & Spencer, 2012).

The uncertainty regarding its origin as a term might explain why it is difficult to find a consensual definition for the term *creativity* within the literature (Amabile, 1982; James, 2016; Lucas, Claxton, & Spencer, 2012, 2014; Mullet et al., 2016; Plucker & Makel, 2010; Rhodes, 1961; Salakhatdinova & Palei, 2015). This lack of agreement between theorists (Adams, 2005) may be a consequence of the broad and complex nature of creativity itself (James, 2016; Lemons, 2011; Mullet et al., 2016). Furthermore, it is generally assumed that creativity cannot be fully understood as an isolated discipline or dimension and is therefore multidimensional (also called multifaceted) (An, Song, & Carr, 2016; Chan & Yuen, 2014; Feldman, 1999; Florida, 2014; Horng, Tsai, & Chung, 2016; Lucas, Claxton, & Spencer, 2012; Mullet et al., 2016; Villalba, 2008). Rhodes (1961) was one of the first to adopt this perspective, and through his exhaustive work of

analyzing the different meanings of *creativity* he concluded that it could be divided into four different "strands". Thus, he constituted the taxonomy of the *Four-P*s of creativity: Person, Process, Press and Product (Rhodes, 1961).

In this way, creativity is presumed to be an innate skill, capacity or potential (Process) that serves to create something both "novel" and "appropriate" (Product), and can be fostered in all individuals (Person) under certain conditions (Press) (Blessinger & Watts, 2016; Florida, 2014; Ho, Soh, & Ho, 2006; James, 2016; Kelley & Kelley, 2013; Mullet et al., 2016; Nickerson, 1999; Plattner, 2016; Robinson, 2011; Ward, Smith, & Finke, 1999). This perspective presumes that everyone has "limitless" creativity (Florida, 2014:xi), since it is innate to the human condition, in opposition to the often misconceived view of a "mystical affair" (Florida, 2014:18; Sternberg & Lubart, 1999:4) in which creativity was attributed purely to the talented. However, since the nineties, research into creativity has reached beyond those who are "gifted" and has become more focused on the widely recognized "creativity for all students" (Craft, 2006:27). Nature and nurture work together within creativity, where "innate talent" boosts the acquisition of required expertise and contributes to a successful performance (Simonton, 2012:220); in other words, as is it were a muscle that needs motion to gain strength, students can exercise their creative thinking provided they have the necessary time, patience and persistence in order to flourish (Watts & Blessinger, 2016).

Rhodes' model of creativity has served as a basis for other researchers in the field to build their own theories. One such example is the psychometric approach to the study of human creativity by Plucker and Renzulli (1999), which focuses on four specific areas; namely, creative processes, the creative person, creative products, and creative environments. Likewise, Simonton (2008:680) provides three possible definitions in relation to creativity that are dependent on the person, product, or process focus. Sternberg's (2006) "Investment Theory" presumes that creativity results from the confluence between six interrelated resources, including Intellectual abilities, Knowledge, Thinking styles, Personality, Motivation, and Environment.

1.2. Creativity Conceptions in Education

The main challenge of current university education is to nurture creativity in the classroom (Cachia et al., 2010) and to train students for an innovation-demanding society (Grudzinskiy & Bednyy, 2012). To this end, universities need to make structural changes in their curricula (Lucas, Claxton, & Spencer, 2014; Razzouk & Shute, 2012; Watts & Blessinger, 2016) that will effectively promote the creativity of all the agents involved in the teaching-learning process by exploring, innovating and allowing co-creation of new knowledge (Stefani, 2016:200). Moreover, various authors support the idea that reflecting creativity "coherently" throughout the curriculum should be given the same importance as any other aspect of a formal curriculum by educational centers (Ferrari, Cachia, & Punie, 2009:3; Lucas, Claxton, & Spencer, 2012, 2014).

The problem lies in that creativity has long been perceived within the educational sphere as a rare phenomenon applicable to only a small group of people; something "exceptional" or "uncommon" (Watts & Blessinger, 2016:214). This erroneous notion, in addition to the lack of a consensus regarding the definition of creativity (Amabile, 1982; Lucas, Claxton, & Spencer, 2014), makes it crucial for teachers to have a clear idea of what creativity is and what strategies can be used in the classroom to promote it (Chan & Yuen, 2014). Many academics have limited knowledge or are unfamiliar with the literature regarding research on creativity and creative learning techniques to facilitate problem-solving. Therefore, it is very difficult for them (if not impossible) to translate the terminology of creativity and adapt its processes to their disciplines (Jackson, 2006a). This reality was made patent in a meta-analysis conducted by Mullet and colleagues (2016), in which the authors synthesized the overall perceptions of teachers towards creativity. The study concluded that teachers' conceptions of creativity are overall "limited, vague or confused". For this reason, it is now crucial for teachers to identify and understand the personality, process, product, and environmental factors that promote creativity. Furthermore, in general, teachers lack the skills needed to properly assess creativity, being unable to distinguish in most cases the difference between students' creativity itself and creative products. This is why it is important for teachers to accept and embrace the conceptualization of creativity (Lucas, Claxton, & Spencer, 2012, 2014),

without falling into the trap of oversimplifying its meaning. Therefore, forms of help, such as training programs, seem to have a substantial effect in clarifying what creativity is and how to identify and work on it in the classroom, as previously mentioned (Lucas, Claxton, & Spencer, 2014; Mullet et al., 2016).

Teachers' conceptions of creativity differ from those of researchers, making it difficult for the former to recognize and encourage creativity in the classroom (Mullet et al., 2016). Moreover, some teachers tend to think that, although creativity skills can be taught to all students, not all students will eventually be able to use them successfully (Watts & Blessinger, 2016). When participating in a training session or a professional development program, this discrepancy among teachers' and researchers' definition of creativity tends to disappear, as teachers acquire the tools needed to conceive creativity as a universal potential skill that all students can improve (Watts & Blessinger, 2016), rather than regarding it as an innate quality possessed by only some students (Mullet et al., 2016). Consequently, teachers' conceptualizations of creativity "mature" and move closer to those of researchers. Therefore, university teachers should analyze their own understandings of creativity, as it will allow them to "reconfigure" their practices in order to eventually enable students to develop their own creativity (Jackson, 2006a:2).

1.3. The Need for Creativity in Higher Education

Creativity lies at the basis of all kinds of learning (Starko, 2014). Indeed, creativity and learning complement each other to the extent that they are interdependent (Beghetto & Karwowski, 2018). In this way, creativity is now not just seen as an opportunity, but as a necessity in education (Ferrari, Cachia, & Punie, 2009; Lucas, Claxton, & Spencer, 2012, 2014; Robinson, 2011) that should be promoted from the early educational stages (Chiecher et al., 2018). However, whilst creativity is certainly not absent from education at present, it is not yet at its core; it is generally taken for granted, in juxtaposition to the predominating "analytic way of thinking" currently favored in the academic field (Jackson, 2006a:3). Thus, while Higher Education institutions create and nurture new knowledge through their research, few educators apply the same level of creative thinking and knowledge generation in the classroom (Stefani, 2016).

Whilst schools have been often criticized for being innate creativity inhibitors among students (Robinson, 2011), a renewed system of schooling would seem to represent the way to fulfill the task of promoting creativity on a large scale (Pecheanu & Tudorie, 2015; Resnick, 2008). Every student is able to develop their creative ability when provided the sufficient time and right environmental conditions (Watts & Blessinger, 2016). However, for several years now, education seems to have been "failing" in the task of preparing young people to be creative (Csikszentmihalyi, 2006:19). Hence, Higher Education needs to reconfigure instruction in such a way that students are not only enabled to show their creativity, but are also given the opportunity for developing, steering and taking ownership of it (Watts & Blessinger, 2016).

Within this context, it seems paramount that Higher Education nurture creativity among undergraduates (Chiecher et al., 2018). Furthermore, all students should learn how to channel their creativity by the time they graduate (Simonton, 2012). For this reason, creative learning is regarded as a quality indicator within universities (Watts & Blessinger, 2016). Higher education should therefore focus on shifting towards creative learning pedagogies or innovative pedagogies aimed at training students to be creative, to face changes, to manage and analyze information, and to process knowledge (Craft, 2006; Dolšak & Hillyard, 2016; Reisman, 2016).

Summary and Conclusions of the First Chapter

The origin of creativity as a term is uncertain, and its definition has been object of controversy for decades. However, Rhodes' (1961) Four-P Model shed some light among theorists by describing creativity as a complex and multidimensional phenomenon. Despite the absence of a consensual definition, creativity is an essential part of the 21st century skill set, and there seems to be little doubt about the need for developing student creativity throughout the different educational stages. To achieve this, however, it is crucial for educators to clarify their (often misconceived) notions of creativity, in order to agree a consensual definition (Amabile, 1982; Lucas, Claxton, & Spencer, 2014; Watts & Blessinger, 2016). Higher Education is regarded as a particularly relevant stage for promoting creative thinking among students (Chiecher et al., 2018), despite criticisms about not nurturing undergraduate creative potential (Csikszentmihalyi, 2006; Stefani, 2016). Embedding creativity in the university fabric means renewing an educational system which has traditionally favored rational or logical thinking and prioritized students' academic efficiency (Jackson, 2006a). In this context, shifting towards creative learning can be considered a sign of quality in Higher Education (Watts & Blessinger, 2016).

CHAPTER 2

From Creativity to Creative Self-Efficacy

The previous chapter dealt with the conceptualization of creativity and its development in educational contexts, evidencing a need for it embedment in Higher Education curricula. This chapter reviews the scientific literature that explores our self-beliefs about creativity. Hence, creative self-efficacy will be defined as a part of the Creative Self and it will be conceptualized by including information regarding its dimensionality and measurement. Moreover, we will describe specific variables (internal and external sources) that can affect self-judgments on individual creative capacities. At the end of this chapter, creative self-efficacy will be explored within educational contexts, where its influential role in subsequent creative performance is discussed.

The Creative Self

In an attempt to better understand the complexity of creativity, researchers have traditionally studied it from a variety of viewpoints, resulting in different classifications. One of the most studied perspectives in creativity has focused on cognition (Simonton, 2012; Sternberg & Lubart, 1999), since every human being possesses the mental or cognitive capacities to imagine, explore, synthesize, connect and adapt (Dolšak & Hillyard, 2016; Martindale, 1999; Mayer, 1999; Nickerson, 1999; Starko, 2014). Bearing in mind that the understanding of creativity is still incomplete, a wide variety of creativity practitioners, such as academics, workers or parents, can find meaning in more unexplored fields beyond the study of the cognitive mechanisms underlying the creative process. Hence, the exploration of 'the creative self' constitutes a growing research area focused on the exploration of individuals' self-beliefs of creativity (Karwowski & Kaufman, 2017), in which self-perceptions of creativity have become relevant variables in the study of creativity (Elisondo, 2012).

2.1. Creative Self-Efficacy

Human behaviors are shaped by many different factors, and the way individuals perceive themselves exerts an influence on the way they behave and act. Based on Bandura's Social Cognitive Theory (1997b), the concept of self-efficacy is commonly defined as the judgment about one's ability to plan and successfully perform a given task. It is considered a strong predictor of people's cognitive, motivational, and affective

behaviors (Sesen, 2013), to the extent that individuals with similar skills may perform very differently depending on their beliefs of personal efficacy (Bandura, 1997b). The extensive body of research in self-efficacy has been extrapolated to a variety of fields in which creativity becomes relevant. In fact, self-efficacy significantly affects individual creativity (Hahn & Lee, 2017). Thus, creative self-efficacy emerges as a relevant construct resulting from the combination of research on both creativity and self-efficacy, where creative self-efficacy is considered as a specific part of self-efficacy (Brockhus et al., 2014).

One of the earliest references to creative self-efficacy found in the literature was published by Starko in her PhD dissertation, referring to it as "self-efficacy with regard to creative productivity" (Starko, 1986:2). Furthermore, creative self-efficacy appeared as a term in Plucker and Runco's research (1998:37), when they suggested that researchers identify both specificity and generality conditions of creative production "during each creative moment". However, Tierney and Farmer (2002) offered the first official definition of creative self-efficacy as a construct, in addition to developing an instrument to measure it. Creative self-efficacy was thus defined as the perceived belief in one's ability to perform creatively (Tierney & Farmer, 2002).

2.1.1. Current Conceptualization of Creative Self-Efficacy

Creative self-efficacy has recently been classified as a part of those beliefs that create an overall sense of creative identity (Beghetto & Karwowski, 2017; Karwowski, Han, & Beghetto, 2019; Karwowski, Lebuda, & Beghetto, 2019). Moreover, creative self-efficacy and creative self-concept are two specific types of creative confidence beliefs, which operate together with creative self-awareness and creative self-image to build the creative self. Similarly, researchers at Stanford University conceive creative self-efficacy as a more specific concept than creative confidence, although they are often treated as synonyms (Jobst et al., 2012; Royalty, Oishi, & Roth, 2012; Royalty, Oishi, & Roth, 2014; Royalty & Roth, 2016). Figure 1 depicts the classification made by Karwowski and colleagues (2019), in which creative self-efficacy is a form of creative confidence.

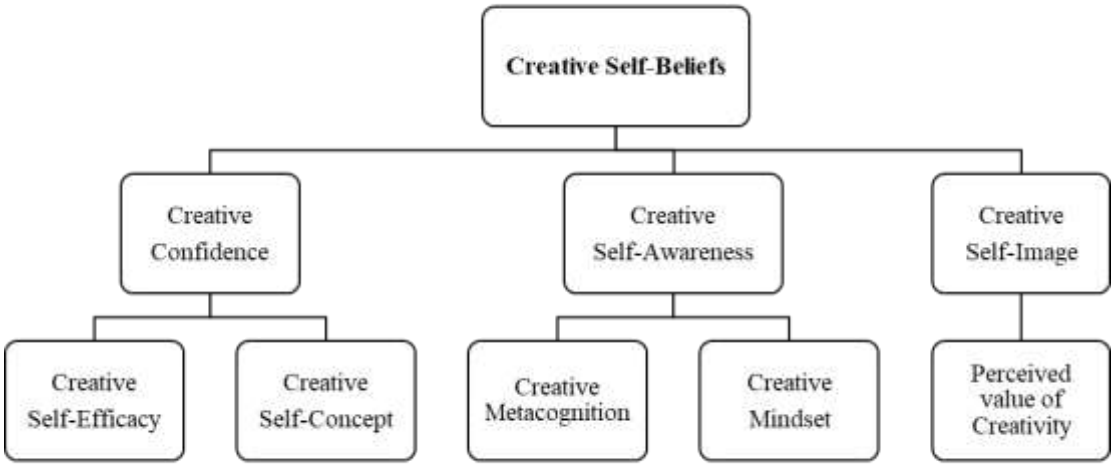

Figure 1. Classification of the Creative Self-Beliefs (adapted from Karwowski, Han, & Beghetto, 2019)

The same authors assign three dimensions to each type of creative self-belief; namely, *specificity* (from global to specific), *temporality* (from past to future) and *stability* (from static to dynamic) (Beghetto & Karwowski, 2017; Karwowski, Han, & Beghetto, 2019; Karwowski, Lebuda, & Beghetto, 2019). If creative self-efficacy is assessed within these parameters, it is:

a. **Specificity**: *Highly specific*, because it may vary depending on the particularity of the task and domain features.

b. **Temporality**: *Future-oriented*, since it refers to the beliefs about one's capability to perform a forthcoming task in a creative way.

c. **Stability**: *Dynamic*, as it is influenced not only by the nature of the task, but also by the sources of self-efficacy that are mastery experiences, vicarious experiences, verbal persuasion, and affective states.

The malleability of this construct has been evidenced in the literature by Tierney and Farmer (2011), who found that alterations in task requirements in addition to a lower control had a diminishing effect on employee creative self-efficacy. Nevertheless, after a 6-month adjustment period, subjects' creative self-efficacy became stronger. Creative-

self-efficacy is therefore a pliable construct, since it is easily influenced by individual, task, and contextual factors, and, thus, does not remain stable in time (Tierney & Farmer, 2011).

2.2. Sources Influencing Creative Self-Efficacy

Creative self-efficacy is a malleable and dynamic construct, easily influenced by various sources. However, as in other areas of social sciences, it is difficult to establish a cause-effect relationship with regards to creativity (Craft, 2006). Furthermore, the practices and conditions that have a direct positive impact on the complex task of promoting the undergraduates' creative skills are not easily defined. Nevertheless, it is commonly agreed that the factors influencing self-judgments about one's creative capacities can be classified in two major groups: a) Internal sources and b) Contextual sources.

2.2.1. Internal Sources of Creative-Self-efficacy

The "creative person" refers to the human being who generates ideas or "creative products" (Nickerson, 1999:392) by means of a set of personal characteristics such as "personality, intellect, temperament, physique, traits, habits, attitudes, self-concept, system of values, defense-mechanism and behavior" (Rhodes, 1961). These characteristics comprise personal values and emotional patterns that directly influence and shape the way that creative individuals think and act (Starko, 2014). As with creativity, nature and nurture work together so that "innate talent" boosts the acquisition of the expertise required for a successful performance (Simonton, 2012:220). Furthermore, individuals can shape self-perceptions about their creative abilities. Thus, the literature shows that personality and affective states are amongst the most studied internal sources influencing creative self-efficacy.

Personality

Research in creativity has often been oriented towards personality (Amabile, 1982), because individuals with high creative potential are also presumed to possess specific personality traits (Li et al., 2014). Since personality plays an important role in

the study of creativity (Feist, 1999), it is thought that some personality dimensions might also be positively related to creative self-efficacy. For this reason, several studies have been conducted to examine potential positive correlations between creative self-efficacy and the dimensions of the Big Five model.

According to this theory, the five broad personality traits are Extraversion, Agreeableness, Openness, Conscientiousness, and Neuroticism (de Raad, 2000). A meta-analysis conducted by Batey (2017) found that self-perceptions about one's creative abilities are most consistently related to Openness to Experience, followed by Extraversion. Elsewhere, Karwowski and colleagues (2013) conducted a study with over 2600 participants from Poland and found that Openness to Experience was the personality trait with the strongest positive correlation to creative self-efficacy, whilst Neuroticism was found to have the strongest negative correlation. Extraversion and Conscientiousness were also found to positively relate to creative self-efficacy, whereas Agreeableness correlated in a negative way.

Similar results have been reported in the literature with regards to potential cultural differences in the relationship between personality and creative self-efficacy of individuals from Asian cultures. In a study involving 545 secondary school Chinese students, almost every aspect of the Big Five model was found to be significantly correlated in a positive way to student creative self-efficacy (Tan, Li, & Neber, 2013). The authors found that students whose beliefs in their creative abilities were high also showed high levels of Openness to experience, Extraversion, Conscientiousness and Agreeableness. Similarly, research conducted in Taiwan with a final sample of 120 workers revealed that employee creative self-efficacy was positively correlated in a statistically significant way with their Openness to experience, Conscientiousness, Agreeableness and Extraversion (Hsu, Hou, & Fan, 2011). Nonetheless, the previously mentioned study by Karwowski and colleagues (2013) suggested potential gender differences for some personality traits; women whose creative self-efficacy levels were high also scored higher in Extraversion, whereas men with high creative self-efficacy reported higher Conscientiousness.

Affective states

The way individuals feel influences how they see themselves. As later explained later on, in the point 3.4 of this dissertation, Bandura's (1997b) four sources for the development of self-efficacy (enactive mastery experiences, vicarious experience, verbal persuasion and affective states) play an influential role in shaping one's perception of one's ability to perform creatively. Previous research has found that possessing positive affect directly influences employee creativity in organizational settings (Amabile et al., 2005). In this sense, holding optimistic views may also play an important role as a mediator in highly creative self-efficacious individuals. For instance, a strong self-view of the ability to perform in a creative way positively impacts on innovative behavior according to research conducted in Asian workplace environments (Supriatna, 2019; Yu, 2019). However, the extent to which creative-self-efficacy positively influences innovative behavior may be mediated by optimism (Hsu, Hou, & Fan, 2011). In addition to fostering affective states that positively influence creative self-efficacy, it is important to avoid feelings that may undermine one's self-view about ability to carry out creative endeavors. In this context, suppressing forces such as cautiousness, hesitancy, introversion or self-censorship have been identified as potential individual creativity inhibitors within team settings (Choi, 2004).

Motivation has been extensively studied along with creativity, owing to the strong association between the two (see the meta-analysis by Da Costa et al., 2015). Motivation is a necessary factor for creativity and plays an influential role, but does not guarantee it (Reiter-Palmon et al., 2012). Whilst there is a debate over the dichotomy between intrinsic and extrinsic motivation, the literature generally suggests that some types of extrinsic motivation (e.g. a strong desire for social recognition) coexist together with intrinsic motivation (the commitment to the task) in a motivational synergy, which is eventually beneficial for a creative individual (Collins & Amabile, 1999:305; Choi, 2004). There is greater internal motivation to start a creative process when the task is considered as a game, rather than as a duty or work (Amabile, 1979, 1988; Csikszentmihalyi, 1999, 2006). For this reason, if Higher Education seeks to embed creativity in its system, it needs to help students discover their passions and then engage with the domain. In this

sense, "harmonious passion" for novel and useful idea generation has been found to have a positive influence on the development of creative self-efficacy (Puente-Díaz & Cavazos-Arroyo, 2017a:310).

2.2.2. Contextual Sources of Creative Self-Efficacy

Rhodes' Creative *Press* (1961) refers to the environment that influences and affects a person and their mental processes whilst involved in creative endeavors. Hence, the creation of learning environments that support and encourage the development of student creative self-efficacy is paramount (Beghetto, 2009). A key starting point might be to remove or impede certain conditions that inhibit the emergence of creativity, like mechanisms of quality and standards (Tosey, 2006). As Baillie argues (2006), educators can exert control over external factors (such as the students' work environment) in order to achieve the "optimal tension zone" that will then prompt their creativity:

> We can generate support for the workshop or creative training session within the department or degree programme so that participants feel that it is an important part of their work. We can also create a room which inspires – use of space, maximizing the senses – use of sound, light, color (Baillie, 2006:153).

When examining environmental factors with the potential to act on beliefs about one's ability to perform creatively, Chong (2010) identified contextual aspects in an organizational environment, which suggests that they can also be found in educational contexts. These contextual factors are expectations and feedback, classroom environment and team setting, and the academic domain.

Expectations and Feedback

The way individuals behave and see themselves is highly influenced by the feedback they receive and the expectations of others, as previously addressed in Bandura's Social Cognitive Theory (Bandura, 1997b). Experiences in the workplace have proved that employees show higher creative performance levels when supervisors expect them to be creative while developing their tasks (Tierney & Farmer, 2002, 2011). Moreover, such expectations by employers also lead to increased creative self-efficacy

levels by employees (Robinson-Morral, Reiter-Palmon, & Kaufman, 2013). Apart from this, the expectations of supervisors seem to be shared by employees, as they positively relate to employee self-expectations of creativity (Tierney & Farmer, 2004). This means that when a supervisor expects their workers to be creative, they also promote a self-expectation of creativity. These self-expectations of creativity, in addition to perceived supervisor expectations, are positively associated with higher creative self-efficacy levels and higher involvement in creative endeavors, with consequently higher creative performance (Carmeli & Schaubroeck, 2007; Tierney & Farmer, 2004). Experiences in organizational environments suggest that, if students are expected to be creative in the classroom, their creative self-efficacy can be positively influenced. One of the essential aspects in fostering creativity is the disposition to do so, as explained by Chan and Yuen (2014), who urge the need for both a positive school support and an environment that recognizes the importance of such improvement in student creativity. In this sense, the results obtained in a study by Beghetto (2006) indicated that teachers can boost student creative self-efficacy by providing them with supportive feedback. Hence, the notion that creative skills can be developed is positively related to student creative self-efficacy beliefs (Puente-Díaz & Cavazos-Arroyo, 2017a), and teachers can play a key role in education through persuasion. After all, students' experience of Higher Education and their future lives in general can be enriched if teachers help them identify, develop, and show their potential throughout the process (Jackson, 2006a).

Classroom Environment and Team Structure

Creating the proper environment with a joyful atmosphere, where students are not only allowed but also encouraged to play, will increase their motivation, autonomy, and self-confidence (James, 2016). Creativity is thus associated with the emergence of new work environments, new lifestyles, and new neighborhoods, all of which can lead to creative performance (Florida, 2014). A study carried out by Tan, Li and Neber (2013) involving over 500 Chinese high school students concluded that classroom environment played an influential role in developing student creative self-efficacy. In this sense, heterogeneity is regarded as an essential condition for creativity (Kochhar-Lindgren, 2016). By giving students the chance to work on an assignment with many other students,

different ideas are used to nurture a solution, thus encouraging collaboration and teamwork (Reisman, 2016:35).

Whilst often viewed as an individual phenomenon or as individual innate skill, creativity flourishes best in a social environment (Florida, 2014; Villalba, 2008). All successful creators rely on their collaborators and contributors, who organize themselves in teams, thus joining forces. Hence, creative potential has both individual and social dimensions. In this sense, teamwork is regarded as a potential moderator since, under certain circumstances, team characteristics can lead to higher levels of individual creativity. Likewise, according to a study carried out by Shin and colleagues (2012) in an organizational environment involving 68 teams, cognitive team diversity favored creativity when the creative self-efficacy of the team members was high. However, this can be challenging, since conflicts among team members have been proved to be detrimental for creativity and levels of performance (Santos, Uitdewilligen, & Passos, 2015). Therefore, developing a creative task in a team setting can be helpful for enhancing individual self-esteem, motivation and achievement, as well as preparing individuals to solve problems in their daily life, hence enriching their lives (Banaji, Burn, & Buckingham, 2010; Nickerson, 1999; Sternberg & Lubart, 1999).

The Academic Domain

The domain-general and domain-specific nature of creativity has been unclear for several decades (Mayer, 1999), because it partially depends on cognitive processes regardless of domain. In contrast, individuals also possess the capability to "tailor" their creative process to a certain discipline or domain (Simonton, 2012). For instance, domain-specific skills have been found to directly influence information system analysts' perceptions of their creative abilities (Yang & Cheng, 2009). In educational contexts, research in creative self-efficacy suggests that students are able to distinguish between self-perceptions of creative ability in different academic domains (e.g. math and sciences) (Beghetto, Kaufman, & Baxter, 2011). Results by Kaufman and Baer (2004) showed that undergraduates who perceived themselves as being creative in general also saw themselves as being creative in different domains, except for mathematics. Furthermore, there is evidence suggesting that perceptions about one's creativity may vary depending

on the academic domain. Studies conducted by Furnham and colleagues (2011) and Kaufman, Pumaccahua and Holt (2013) manifested a trend in which Art students score highest in self-rated creativity (which is related to, but not equivalent to, creative self-efficacy), followed by undergraduates of Natural Science and Social Science. Similarly, Pretz and Nelson (2017) reported a higher awareness of creative abilities in Art, Humanities and Social Science students compared to those from the Sciences. Contrarily, Brockhus and colleagues (2014) found no difference between creative self-efficacy when comparing the results of students of Industrial Design Engineering and Architecture to those of Mathematics and Physics. Nonetheless, it must be noted that, to date, research on creative self-efficacy has mostly been conducted using domain-general instruments. Hence, a growing body of research supports the importance of the domain specificity of creativity, which should be assessed using domain-specific instruments (Baer & Kaufman, 2008; Byrge & Tang, 2015; Reiter-Palmon et al., 2012; Tan et al., 2019).

2.3. Creative Self-Efficacy in Higher Education

The extensive research on self-efficacy conducted over decades by Bandura has been acknowledged in a wide variety of fields. Education has benefited from such research, since beliefs in one's capabilities mediate and predict students' learning, accomplishments, and motivation (Van Dinther, Dochy, & Segers, 2011). However, the perceptions about students' ability to perform creatively may decrease as students advance through the educational stages (Beghetto, Kaufman, & Baxter, 2011; Hung, 2018). In this context, Higher Education would be an important educational stage during which to help students to develop into complete individuals by promoting their creative capacities, creative self-efficacy, self-critical evaluation of their own creativity, and, ultimately, their self-awareness and self-identity (Jackson, 2006b).

When examining the role self-beliefs play in students' learning process, the literature provides evidence of the various benefits for creative ability of enhancing self-efficacy. As with general notions of self-efficacy, students with higher levels of creative self-efficacy are also more likely to hold positive beliefs about their academic abilities and to report higher levels of participation in after-school academics and other after-school group programs (Beghetto, 2006). Moreover, students whose creative self-efficacy

levels are high have been found to score better in after-school academic activities, group activities and entertainment, compared to peers with lower creativity self-efficacy (Tan, Li, & Neber, 2013). Individuals with strong beliefs about their creative abilities seem more equipped to face setbacks, to adopt an approach-based orientation, and to maintain their motivation levels (Intasao & Hao, 2018). This may explain why various authors regard creative self-efficacy as a strong predictor for college success and knowledge retention (Bowman et al., 2019; Richardson, Abraham, & Bond, 2012; Robbins & Kegley, 2010).

Nonetheless, one of the most promising fields of research in creative self-efficacy is that focusing on its link to creative performance, which suggests that self-perceptions of creativity are determinant of creative processes (Kaufman, 2016). However, the relationship between the two constructs (creative self-efficacy and creative performance) remains unclear, since mixed results are reported in the literature. On the one hand, some authors have established a positive relationship, in which creative self-efficacy is regarded as a potential predictor of creative performance (see Elisondo, 2012). Research conducted in organizational environments suggests that high creative self-efficacy levels are positively linked to subsequent increases in creative performance, since a strong sense of efficacy leads people to be more willing to try creative tasks. Likewise, when it comes to education, some studies report a positive relationship between creative self-efficacy and creative performance (Tierney & Farmer, 2002, 2004, 2011). In their study, Brockhus and colleagues (2014) asked 49 undergraduates studying different disciplines in the Netherlands to complete two different tasks (the "apple" assignment and the "river" assignment). After completing both tasks, student creative self-efficacy and creative performance were assessed, the former with a 15-item Questionnaire on Creative Self-Efficacy (QCSE; Brockhus et al., 2014) and the latter with a divergent thinking assignment. The results revealed that participants' creative self-efficacy and creative performance were positively correlated in a statistically significant way only in the "river" assignment. Thus, participants whose creative self-efficacy levels were higher also produced a larger amount of ideas and were overall more diverse and more original. The authors hypothesized that the "apple" assignment might not have been challenging enough, since the answers provided by students were more generic and less creative than

in the "river" challenge. This study demonstrated the important role played by task features in the development of both creative self-efficacy and creative performance.

The positive relationship between these two constructs does not only happen at individual level, but also in team contexts. Baer and colleagues (2008) reported overall higher creative performance in teams whose members shared a belief in belonging to a creatively confident team. In the same line, Choi (2004) found that creative self-efficacy directly influenced creative performance in Business undergraduates in the United States. More recent research reports positive correlations between creative self-efficacy levels and the originality scores in divergent thinking tasks of 491 Business Education undergraduates from Germany and Mexico (Puente-Díaz et al., 2019). This emerging body of research suggests that increased creative self-efficacy levels lead students to formulate more novel and useful solutions (Puente-Díaz et al., 2019) through flexible thinking (Intasao & Hao, 2018).

Any positive influence of creativity training will only be relevant if it is sustained in time. However, most studies regarding creativity training fail to use designs to reliably prove the durability of its effects (see Scott, Leritz, & Mumford, 2004). There is a lack of longitudinal research regarding the temporal stability of creative self-efficacy. One of the few such studies available to date is that by Mathisen and Bronnick (2009), who examined the effects of creativity training on creative self-efficacy. For this purpose, 28 undergraduates and municipal employees underwent a five-day course, while 57 special education teachers attended a one-day course. Subsequent assessment showed that the creative self-efficacy levels of the undergraduates had not decline two months after the intervention course on creativity. It is therefore difficult to establish a generalized cause-and-effect relationship on correlation between creative self-efficacy and creative performance since there is not yet robust evidence to reliably conclude in which direction such correlation exists.

On the other hand, there is evidence from different parts of the world of no association between such constructs, suggesting that no relationship exists between students' creative self-efficacy and their creative performances. For instance, in the United States no association was found between creative self-efficacy levels and the

creative outputs of high school participants after a seven-day engineering summer camp (Denson & Buelin-Biesecker, 2015). Similarly, research conducted by Reiter-Palmon (2012) with 548 university students from the United States revealed no correlation between students' self-perceptions of creativity and the scores they obtained in the different problem-solving measures they used. Puente-Díaz and Arroyo-Cavazos (2016) also failed to establish a statistically significant relationship between the creative self-efficacy and the divergent thinking scores of the 291 Mexican elementary school students who participated in the study. Likewise, research carried out in an Asian context revealed that student creative self-efficacy was not positively related to subsequent performance in educational contexts. An experiment by Hung (2018) involving 1,416 Taiwanese students from different educational levels (Higher Education, secondary school and junior school) found no statistically significant association between higher creative self-efficacy levels and higher scores in creative performance, which was measured in terms of verbal divergent thinking tests. The absence of a statistically significant correlation between student divergent thinking scores and their perceptions of their creative capacity might be owing to a person/process focus conflict (Haase et al., 2018); that is, that while creative performance is related to the creative process, creative self-efficacy focuses on the creative person. Citing Haase and colleagues (2018):

> Creativity and self-efficacy beliefs are related when focusing on the creative individuals and their opinions about their creative skills. Switching focus to performance tests of creative products and creative processes, the relation to self-efficacy becomes weaker. This is in line with self-efficacy theory, which is, by definition, concerned with individuals' own evaluations of their potential. It therefore has no demand on objectivity (Haase et al., 2018:8).

Divergent thinking test scores can reflect greater objectivity compared to the perceived creative ability scored reported by students (Reiter-Palmon et al., 2012). Furthermore, it should be noted that divergent thinking does not represent the full creative process, since the ability to generate ideas may not be synonymous with fulfilling a creative endeavor (Haase et al., 2018). Whilst some studies report a positive correlation between creative self-efficacy and creative performance, they tend to focus on different dimensions of creativity (process versus person). Therefore, the absence of a statistically significant relationship between creative self-efficacy and creative performance might be a product of mixing two different dimensions of creativity.

Summary and Conclusions of the Second Chapter

Since the emergence of Rhodes' Four-P Model (1961), research about creativity has commonly been process-oriented, as it has examined the mental processes underlying creative capacity. However, in the last two decades, researchers, educators and practitioners working in the field of creativity have increasingly focused on the role of self-belief in individual creativity (Karwowski & Kaufman, 2017). Such interest is evident in the growing body of research concerning a new creativity-relevant construct called creative self-efficacy, which refers to the individual's perception of their ability to creatively fulfill a given task (Tierney & Farmer, 2002).

The promotion of creative self-efficacy might be particularly relevant for education, since strong efficacy beliefs are considered powerful predictors of success (Bowman et al., 2019). However, as students' perceived efficacy for performing tasks creatively has been found to decrease as they advance in their educational development (Beghetto, Kaufman, & Baxter, 2011; Hung, 2018), Higher Education needs to play an important role in enhancing the creative self-efficacy of undergraduates. This would explain the increasing interest amongst universities in implementing creativity-training programs and evaluating their effectiveness as a means of enhancing student creative self-efficacy and creative performance. Nonetheless, the long-term effects of creative-training programs, as well as whether high creative self-efficacy levels result in high creative performance, are yet to be clarified.

CHAPTER 3

Design Thinking as an Educational Approach to Promote Student Creative Self-Efficacy

In previous chapters, we have discussed the importance of enabling Higher Education students to develop their creative self-efficacy as a key part of the 21st century skill set. For this purpose, we have offered a review on creative self-efficacy research by conceptualizing it as a malleable multidimensional construct subject to influential factors that can be fostered by adequate training in Higher Education. Hence, in the third chapter we will consider Design-Based Pedagogy as an effective creativity-fostering educational approach, focusing along the way on the Design Thinking process. We will provide a theoretical framework for Design Thinking, where its main stages and foundational principles are directly connected to the theory of self-efficacy. Furthermore, we will review the implementation of Design Thinking in educational contexts related to creativity, with a special focus on the university sphere.

Towards Creative Learning and Innovative Pedagogies in Higher Education

Education has traditionally encouraged and rewarded both conformity and behaviors that are efficient from an academic point of view (Stefani, 2016). This is the reflection of a "highly structured and nationalized education" where the standardized curriculum does not allow any room for questioning the status quo or for following one's passions (Csikszentmihalyi, 2006:18). Within this context, students have been trained to find a single correct solution to problems set by others but have not been taught the skills needed to ASK questions worth answering. The pressure generated by practices oriented towards achieving efficiency seems to create tensions with creativity, inhibiting its emergence (Tosey, 2006). Curricula should provide students with enough freedom and time to discover what they love and what their passions are (Collins & Amabile, 1999). It is therefore important to see the "bigger picture" of the current state of 21st century Higher Education, taking into account its constraints and allowing academic developers to design a curriculum for creative learning (Stefani, 2016:197).

3.1. Design-Based Pedagogy as a Creativity-fostering Educational Approach

In order to meet the needs of a creativity-demanding society, some universities have already begun to question their teaching methods (Colleges & Council, 2007) so as to shift towards "more creative learning environments" (Watts & Blessinger, 2016:216).

Introducing new educational practices aims to better prepare students for the present paradigm (Álvarez-Nobell & Vadillo-Bengoa, 2013:264). Several models of creative learning or innovative pedagogies have been designed (Foster, 2016), but they mainly share the same core: the learning process allows students to interact and to actively make connections between places, materials, methods, questions and experiences whose practices exceed the classroom (Elisondo, 2015; Elisondo, Danolo, & Rinaudo, 2011; Kochhar-Lindgren, 2016:64). That is, creative learning occurs when students are asked to solve complex problems following non-traditional approaches and to "think outside the box" in order to create new knowledge (Csikszentmihalyi, 2006:19; Foster, 2016:154; Stefani, 2016:198). Within this context, Design-Based Pedagogy emerges as an impactful form of education for creative learning.

3.1.1. Design-Based Pedagogy (DBP)

Design-Based Pedagogy (DBP) refers to an "educational environment with instructional scaffolds that allow students to solve problems through the practice of design" (Royalty, 2018:138). Moreover, DBP relies on teaching design to non-designers with the purpose of prompting a sense of being creative, instead of placing emphasis on the acquisition of specific content. As Royalty (2018) further explains, such an educational framework has five main characteristics:

1. **The audience**: It is primarily oriented to non-designers.
2. **The challenges**: They are open-ended and transcend the classroom.
3. **The team**: Students from different disciplines work in radical collaboration within the same team.
4. **The practices**: Tools and methods typically used by designers are applied throughout the problem-solving process.
5. **Creativity**: the aim is to enhance student creativity.

The Design Thinking process presented in point 3.2. is a form of Design-Based Pedagogy, and educators could benefit from its skills and the tools needed to embrace creative learning (Henriksen, Richardson, & Mehta, 2017). Within this educational

approach, students are no longer objects of pedagogy but knowledge-generators within the study field (Stefani, 2016).

3.2. The Design Thinking Process

As previously mentioned, some universities are shifting towards creative learning or innovative learning pedagogies aimed at teaching students to be creative and to face future challenges. Within this context, formal training in Design Thinking is regarded as a requirement today (Pande & Bharathi, 2020). However, there is no consensus on what Design Thinking is, as the different definitions provided by the main Design Thinking supporters and practitioners starkly differ. For instance, whereas Leifer and Meinel (2020) and Kelley and Kelley (2013) define Design Thinking as an innovation method / methodology, Brown (2019) regards it as an exploratory process beyond a style. Elsewhere, Cross (2011) understands Design Thinking as an inherent ability within the human condition. Additionally, Design Thinking has also been defined as a toolbox, a mindset (Brenner, Uebernickel, & Abrell, 2016), and even a paradigm (Dorst, 2010). In the present dissertation, Design Thinking will be viewed as a human-centric process aimed at creating innovative solutions to "ill defined" or "wicked" problems (Beyhl & Giese, 2016:49; Cross, Dorst, & Roozenburg, 1992:8; Rowe, 1987:40-41) by applying the cognitive mechanisms followed by product design engineers. According to the ten properties of Rittel and Webber (1973), wicked problems:

1. Lack a definite formulation.
2. Have no stopping rules.
3. Have neither true nor false solutions but are good or bad.
4. Have no immediate and ultimate testing systems for solutions.
5. Have solutions that are "one-shot operations", where every attempt counts significantly.
6. Have more than one possible explanation, which depends on the designer.
7. Are symptoms of other problems.

8. Leave no room for trial and error.
9. Are unique.
10. Are those in which the designer has no right to be wrong.

In order to provide an innovative solution to these wicked problems, the core of every design process consists of two phases: problem definition and problem solution. As Buchanan further explains (Buchanan, 2010):

> Problem definition is an analytic sequence in which the designer determines all of the elements of the problem and specifies all of the requirements that a successful design solution must have. Problem solution is a synthetic sequence in which the various requirements are combined and balanced against each other, yielding a final plan to be carried into production. (Buchanan, 2010:25).

However, solving wicked problems requires more complex processes than deduction and induction, and for this reason Design Thinking is regarded as an abductive process (Cross, 2011; Dorst, 2010). The designer knows the value that needs to be created, but both the outcome and the means (or the 'working principle') are unknown (Cross, 2011; Dorst, 2010). Design thinking thus acts as an innovation catalyst where wicked problems are addressed as complex challenges, which are regarded as "design opportunities" (IDEO, 2012:11). Its mission is to translate observations into insights and, ultimately, these insights into new products or services (Brown, 2019). The process of Design Thinking aims to facilitate the generation of innovative solutions that are desirable to some kind of user, economically viable, and technologically feasible (Brown, 2019; Kelley & Kelley, 2013; Meinel & Leifer, 2011; Plattner, 2012, 2015, 2016).

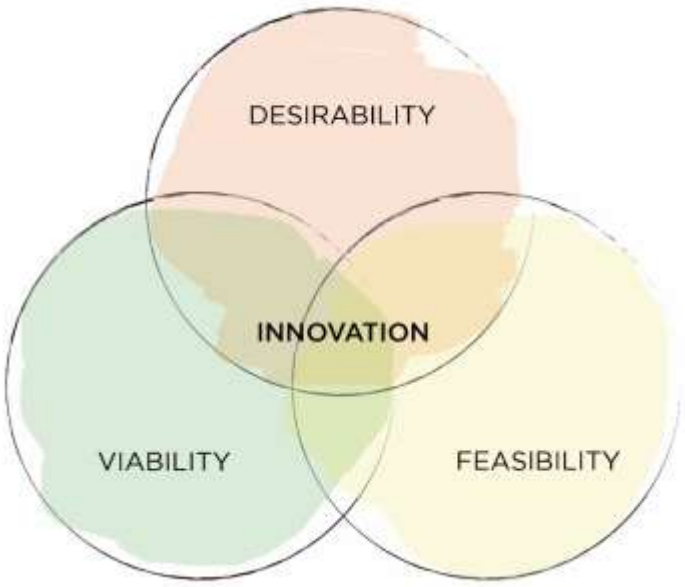

Figure 2. Components of Innovation (adapted from Kelley & Kelley, 2013)

Design Thinking works within the three components of innovation; namely, human beings, business and technology (Brown, 2019; Kelley & Kelley, 2013; Meinel & Leifer, 2011:xiii). For such purposes, people from different disciplines gather in "high impact teams" and work together through radical collaboration, as creative outcomes are more likely to occur in approaches that are not limited to a single discipline or curricular space (Elisondo, 2015, 2018; Elisondo, Donolo, & Rinaudo, 2009). Multidisciplinarity does not refer to an accumulation of knowledge from many different disciplines, but rather an "adding up" to a totality (Kochhar-Lindgren, 2016:63), as if they were different sides of the same thing. Such a multidisciplinary approach aims to provide undergraduate students with a dynamic vision of the world as a whole, as exemplified by Ambrose (2016):

> One of our largest and most pressing macro-problems – climate change – will require natural scientists, social scientists, policymakers, and a strong critical mass of citizens to understand ways in which theory and research from climate science, economics, political science, ethical philosophy, and other disciplines must interweave to create a coherent strategy for grappling with this enormous issue, which threatens our very survival as a species (Ambrose, 2016:37).

Addressing such 21st century global challenges is a complex task, and educational models based on information transmission and retention have no incentive for students to try fresh approaches to reach new possibilities (Watts & Blessinger, 2016). Unlike Design Thinking, most courses to date have been outcome-based designed (Jackson, 2006a). These predictive courses inhibit student creativity because they determine what students have to learn and eventually produce and leave no room for them to explore unpredicted aspects during the process. As a result, students will not gain knowledge as part of their own learning experience (Foster, 2016). In order to avoid this, Design Thinking instructors are learning facilitators who guide and support by assisting students to succeed in problem-solving, teamwork, and creativity (Brookfield, 2016; Foster, 2016; Kochhar-Lindgren, 2016; Reisman, 2016).

Facilitating learning means encouraging students to discuss (Brookfield, 2016) and work collaboratively in order to find and verify, by themselves, solutions to a particular problem, instead of being instructed or merely lectured. A good facilitator will try to match the most suitable approach or technique for the group of participants; Moreover, they will play a key role in making connections between the "fuzzy" ideas and the real problem, while remaining outside the discussion to make the rest feel empowered by the process (Baillie, 2006:153). Eventually, these facilitators have the responsibility of instilling in their students the belief that creative skill can be enhanced if allowed enough time (Elisondo, Donolo, & Rinaudo, 2009; Puente-Díaz & Cavazos-Arroyo, 2017a). To allow this, Design Thinking instructors provide practitioners with the *tools* and *mindsets* needed in order to create impactful solutions (Edelman et al., 2020:16). These tools and mindsets are founded on four principles (IDEO, 2012:11; Meinel & Leifer, 2011, 2012, 2015; Plattner, Meinel, & Leifer, 2014):

- **The Human Rule**: Human value must be placed at the center of the design process to successfully satisfy users' needs.
- **The Ambiguity Rule**: Preserving ambiguity and being in a "rebuilding mode" helps to create multiple alternative futures.

- **The Re-Design Rule**: All design is re-design, looking back to how human needs were addressed in the past to better apply "foresight tools and methods".

- **The Tangible Rule**: Ideas are best expressed when they become tangible, and building prototypes gives "permission" to fail and learn from mistakes.

Taking these four principles as a basis, the Design Thinking process can acquire different shapes. In fact, there is not an established model for such a process, as Design Thinking constantly evolves and adapts to each field and circumstance. Kelley and Kelley (2013) address Design Thinking as a four-stage process (*Inspiration, Synthesis, Ideation and experimentation* and *Implementation*), later condensed into a three-stage model *(Inspiration, Ideation* and *Implementation*) (IDEO, 2015:11). Likewise, IDEO's CEO Tim Brown defines Design Thinking as a process in which design teams 'move through three overlapping spaces over the course of a project"; namely, an *Inspiration space*, an *Ideation space* and an *Implementation space* (Brown, 2019:69). Elsewhere, a seven-stage model constituted by *Understand, Observe, Define Point of View, Ideate, Develop Prototype, Test* and *Reflect* phases is also applicable (Lewrick, Link, & Leifer, 2018). Nonetheless, in the present study we describe and use as a basis the Design Thinking model applied at both the Stanford d.school and the HPI Institute at Potsdam.

3.2.1. D.School's Design Thinking model

Design thinking originated at Stanford University in California and has been implemented there since the late 1970s. Nonetheless, it was in 2005 when Bernard Roth and David Kelley, amongst others, founded the Hasso-Plattner-Institute of Design (d.school) with the aim of training graduates from Stanford in Design Thinking in order to become future innovators (Kelley & Kelley, 2013). Two years later, in 2007, another School of Design Thinking (D-School) began operating within the Hasso Plattner Institute (HPI) at the University of Potsdam, in Germany (Plattner, 2011). Since then, both universities have conceived Design Thinking as comprising of five different divergent-convergent design phases, which are E*mpathize, Define, Ideate, Prototype* and *Test* (see Figure 3).

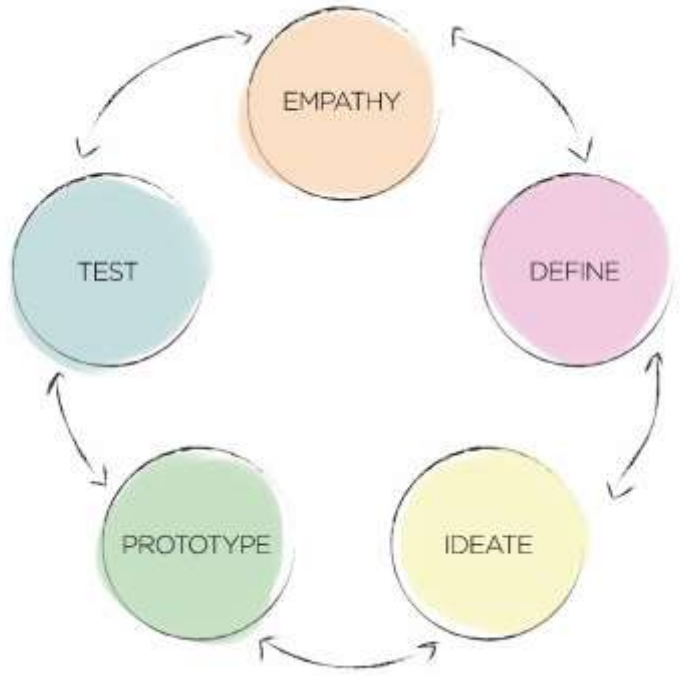

Figure 3. D.school's Design Thinking Model (adapted from Doorley et al., 2018)

The following concepts constitute a summary of various Design Thinking books and guides (Doorley et al., 2018; Kelley & Kelley, 2013; Lewrick, Link, & Leifer, 2018; Plattner, 2010):

Empathize

The challenges addressed in Design Thinking are open-ended and ambiguous. As the first step of the process, building empathy with users is the starting point for human-centered design because the problems that are being addressed are someone else's. The design team needs to learn from their users by observing them, engaging with them, and becoming immersed in their context in order to gather as much information as they can. Direct interaction with users will help to identify their needs, and, thus, to design better solutions. The methods and tools most commonly used within this phase are empathy interviewing, asking the five WH questions (what, where, when, why and how), shadowing, making a photo-journal, creating personas and empathy mapping, among others.

Define

The second step of the Design Thinking process is to Define. Understanding the problem is fundamental to providing users with a successful solution. For such purposes, the most valuable information gathered during the Empathy phase is filtered and classified into needs and insights, and then visually displayed (on post-its, either with words or drawings etc.). The goal is to create a common perspective on the design problem based on the understanding of the user, and for it to be framed as a Point of View (PoV) statement. This statement will not only serve as a launch pad for generating solutions but will also create a unique design vision within the team. Some of the typical techniques applied at this stage are the customer's journey and daisy map.

Ideate

Within the third stage of the Design Thinking process, Ideation moves the design team from problem-identification to solution-exploration. Moreover, it is a divergent phase in which wild ideas are highly encouraged; a great amount of varied ideas benefits the exploration of a wide solution-space. Thus, a great number of ideas are created as potential alternatives for solving the design problem by using brainstorming and creativity-fostering techniques (e.g. SCAMPER). At the same time, it is crucial to inhibit behaviors that can hamper idea-generation, such as early judgment and evaluation, because some of the most disruptive concepts have originated from unusual ideas. Eventually, the best ideas are selected and/or combined into more complex ones.

Prototype

Prototype constitutes the fourth step in the Design Thinking process, because ideas are best expressed when they leave the designer's mind and become tangible. For this reason, the design team will choose the best idea and build a prototype. Anything that takes physical form can be regarded as a prototype (e.g. Sketches, mock-ups, storyboards and/or teaser-videos, role-playing, storytelling etc.). The goal at this point is to build a low resolution prototype using inexpensive material (paper, colored pens, scissors, glue…) in order to allow users to interact with it, while designers gain user empathy by

starting a conversation with them. Student teams will produce one or two testable prototypes by the end of this phase.

Test

Testing prototypes is the last phase of the process, and it refers to the act of going back to the user and showing the proposed solution in their context. Opportunities for learning are created when designers allow users to interact with their low-resolution prototype. The goal is to capture user feedback to refine the solution. Since Design Thinking is an iterative process, testing allows designers to continue learning about the users, not only to refine the solution but also to re-frame the point of view if necessary. Testing is usually conducted through face-to-face interviews, observation and documentation, A/B testing etc., and insights are later displayed in a feedback-capture grid.

The design phases described above are rarely followed in a linear way, but rather they overlap and constantly adapt depending on the project. In fact, Design Thinking is characterized by being an iterative and non-linear process (Henriksen, Richardson, & Mehta, 2017). Donar (2011) encourages diversity instead of unifying the tools, methods, and phases in an ultimate, universal, and standardized Design Thinking process, because this contradicts the innovative essence inherent to the design process. The variety of existing models, in addition to not following a fixed scheme, are regarded as positive for contributing to the innovative spirit of Design Thinking. Moreover, both schools and universities should adapt it according to their characteristics and needs. In the following section, we will provide an overview of how Design Thinking has been implemented in educational contexts and its implications with regards to student creativity.

3.3. Design Thinking in Educational Contexts

There has been considerable interest within the last decade in researching how Design Thinking impacts students' learning experience. Gaining expertise in Design Thinking enables students to think in a radically different way (Lugmayr et al., 2014), to understand failure as part of the learning process, and to create more effective solutions, owing to a deep understanding of the user and the problem-space (Melles, Howard, & Thompson-Whiteside, 2012). Students who develop Design Thinking skills are readier to face problems, *think outside the box* and generate more innovative solutions (Razzouk & Shute, 2012).

However, Design Thinking is a process that can be carried out over a day-length workshop, or as part of projects that last for several months (Guaman-Quintanilla et al., 2018). Furthermore, students can be trained in Design Thinking either face-to-face or via MOOCs (Wrigley, Mosely, & Tomitsch, 2018), in which case both the learning goals and subsequent impact on students will vary (Royalty et al., 2019), resulting in difficulties for assessment. Guaman-Quintanilla et al. (2018) reviewed 79 studies indexed on the Web of Science between 2008 and 2018 regarding the application of Design Thinking to engineering and management education. Among the most noteworthy findings was that a quarter of the studies reported an impact of Design Thinking on students, with creativity being one of the most mentioned outcomes.

Despite being rooted in the field of mechanical engineering, Design Thinking rapidly spread to other disciplines (Adams, 2005), largely due to the positive experiences reported by students (Guaman-Quintanilla et al., 2018). For this reason, the number of universities embracing Design Thinking has increased over recent years, as evidenced in the literature. For instance, it has been applied to a variety of academic domains including Business Education (see Çeviker-Çınar, Mura, & Demirbağ-Kaplan, 2017; Matthews & Wrigley, 2017; Withell & Haigh, 2013; Withell & Haigh, 2017), Computer Science Education (Djordjevic, 2019; Milosz, 2016); Language Training and Translation (Kasperavičienė, Maumevičienė, & Motiejūnienė, 2018) and Nursing (Beaird, Geist, & Lewis, 2018), amongst others.

Elsewhere, there are global initiatives such as the SUGAR Network, which brings together universities and companies to provide innovative solutions through a Design Thinking-based learning experience. By the beginning of 2020, a total of 28 universities formed part of the network:

> Aalto University, Anhui University, Blekinge Institute of Technology, Design Factory Melbourne, d.school Paris at Echole des Ponts, Hasso Plattner Institute, University of St. Gallen, ISDI Parsons Mumbai, Karlsruhe Institute of Technology, Kyoto Institute of Technology, Linköping University, Norwegian University of Science and Technology, Pontificia Universidad Javeriana Cali, Politecnico di Milano through Poli.design S.C.R.L, Politécnico do Porto, San Francisco State University, Shenkar Engineering. Design. Art., Trinity College Dublin, Technical University of Munich, Tongji University College of Design and Innovation, Université Côte D'azur, Universidad Nacional Autónoma de México, Università di Modena e Reggio Emilia, Universidade de Sao Paulo, University of Science and Technology of China, Universit'a di Bologna, Warsaw University of Technology and Inno.space Design Factory Mannheim.

The implementation of the Design Thinking process often takes place in a laboratory setting. This is the case of DevLAB, a Design Thinking-based laboratory set up in the Oulu University of Applied Sciences in Finland, where students from different disciplines carry out projects following the Design Thinking process in fields such as health and social care, tourism, energy and environment (Karjalainen, 2016).

An experiment conducted by Nicolai and her team (2016) at the HPI School of Design Thinking in Potsdam indicated that the workspace has a positive influence effect on students' creativity. In their study, three student teams were asked to complete three different tasks, in which one consisted of designing different spatial settings and describing how it would prompt specific working modes that contribute to the team's well-being. Results revealed that creativity can be fostered when teams are encouraged to select and transform a certain workspace to adapt it to their own needs. More specifically, students stated that "the flow of motions went up" during that process,

suggesting that the freedom to choose is a potential factor to prompt creativity (Nicolai et al., 2016:137). This study supports the notion that in order to extend one's capabilities, knowledge and vision (James, 2016), it is necessary to break the norms and even the rules (Florida, 2014), which is the spirit of creativity.

Elsewhere, initiatives can be found at the Entertainment and Media Management Lab. (EMMi Lab.), within the Tampere University of Technology (TUT) (Lugmayr et al., 2014), the Design Thinking Loft of the University of St. Gallen (Brenner, Uebernickel, & Abrell, 2016) or the MIT Design Lab at the Massachusetts Institute of Technology, amongst others.

Creativity in Design Thinking

Understanding how Design Thinking influences student Creativity is a topic of interest within Design Thinking research, due to the close similarity between the five phases of the Design Thinking process (Empathize - Define - Ideate - Prototype - Test) and the four-stage creative process model (Preparation - Incubation - Illumination - Verification) proposed by Wallas (1926). For instance, Design Thinking has proved beneficial when fostering student ability to think creatively in Product Design and Development (Clemente, Vieira, & Tschimmel, 2016) and Tourism education (Sándorová et al., 2020).

A body of research has focused on the cognitive impact of Design Thinking in creativity by exploring the way creativity is manifested in neural networks using functional brain imaging (fMRI). Students have been found to increase attention and information processing speed after undergoing a Design Thinking-based creativity training course called "Creative Gym" (Bott et al., 2014; Saggar et al., 2015:33). In another experiment by Saggar et al. (2016) students were asked to improvise a Design Thinking-based creative task, and neuroimaging results revealed a higher activity in specific parts of the brain, such as the cerebellum, thalamus, left parietal cortex, right superior frontal, left prefrontal and paracingulate/cingulate regions. The assumption that Design Thinking (through creative tasks) may exert an influence in certain areas of the brain by increasing activity has opened a line for future research into neurodesign (Leifer

& Meinel, 2020). Nonetheless, it is not the purpose of the present study to explore the possibilities offered by neurodesign, but rather to provide some evidence of neuroscientific research conducted to study how Design Thinking impacts on individual Creativity.

Within this context, the development of creative self-efficacy is regarded as important, since it might be the highest achievement of Design Thinking (Wrigley, Mosely, & Tomitsch, 2018; Wrigley & Straker, 2017). As understanding of the Design Thinking process deepens, students reach a meta-cognitive level in which cognitive or skill-based learning outcomes are exceeded by affective learning outcomes (e.g. self-efficacy). The figure below (see Figure 4) partially depicts the Educational Design Ladder Pedagogy model developed by Wrigley and Straker (2017). This model proposes a progression in the Design Thinking curriculum in terms of knowledge dimension and thinking skills level. According to the authors, affective outcomes constitute the final learning outcomes of Design Thinking and are only achieved when students have "higher levels of understanding and knowledge application" that reach a meta-cognitive level (Wrigley, Mosely, & Tomitsch, 2018:291).

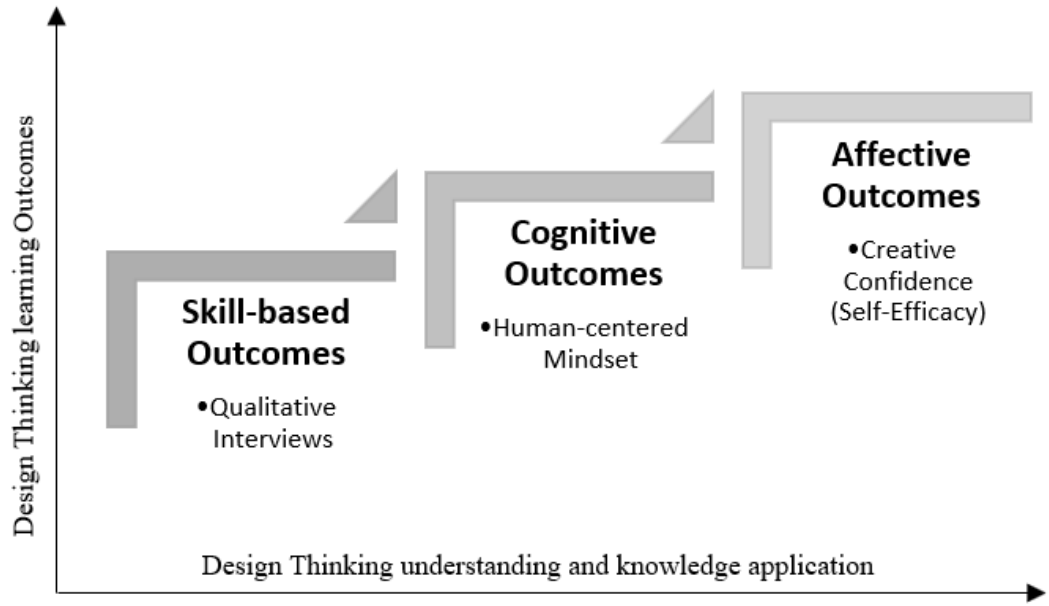

Figure 4. The Educational Design Ladder Pedagogy Model (adapted from Wrigley, Mosely & Tomitsch, 2018)

The greatest impact on student learning via the Design Thinking process is therefore manifested through the development of creative confidence or creative self-efficacy. For this reason, exploring the specific circumstances under which creative self-efficacy is developed might help educators to design more effective Design Thinking training programs. To support this notion, in the following section we establish a direct association between Bandura's theory of self-efficacy and the specific stages, methods and techniques typically used during the Design Thinking process.

3.4. Bridging Design Thinking and the Sources of Self-Efficacy

As it lacks an established model, the Design Thinking process has been linked to different theories, including constructivism (Royalty, 2018; Scheer, Noweski, & Meinel, 2012). Furthermore, the theory of constructivist learning has recently been mapped and directly associated to each Design Thinking phase (see Pande & Bharathi, 2020 for the taxonomy on constructivist learning tenets and their links to each phase of the Design Thinking process). Elsewhere, the theoretical foundations of Design Thinking are related to both Robert H. McKim's Need-Based Design Theory (von Thienen, Clancey, & Meinel, 2019) and John E. Arnold's Creative Thinking Theories (von Thienen et al., 2018).

Following the latter trend, researchers from Stanford University suggest that Design Thinking helps to develop what they call 'Creative confidence', or the comfort in carrying out creative endeavors because of the perceived ability and self-efficacy in the creative domain (Royalty, Oishi, & Roth, 2014:85). For instance, Rauth and colleagues (2010:6) conducted semi-structured interviews with teachers at Stanford' and Potsdam's design schools, and most of them mentioned 'a development of trust in one's own creative skills' as a result of implementing Design Thinking that exposed students to creativity-requiring challenges. In light of such evidence, the present study regards Design Thinking as a useful means to develop student creative self-efficacy.

The design thinking process allows students to develop their creative self-efficacy through sources of self-efficacy (Puente-Díaz, 2016; Royalty, Oishi, & Roth, 2014; Royalty & Roth, 2016). In this context, research by Jobst et al. (2012) becomes relevant,

since they establish a relationship between Bandura's theory of self-efficacy and the principles of the Design Thinking process applied at both Stanford's and Potsdam's Design Thinking schools. According to Bandura (1997b), a person's self-efficacy emerges from four main sources: a) enactive mastery experiences, b) vicarious experiences, c) verbal persuasion and d) psychological and affective states.

3.4.1. Enactive mastery experience

The first and most influential source of self-efficacy is the mastering of difficult tasks. When individuals are guided through a process in which they must face and overcome a series of obstacles, they become confident in their abilities to succeed. Bandura (1997b) names these situations "enactive mastery experiences". He states that:

> A resilient sense of efficacy requires experience in overcoming obstacles through perseverant effort. Some difficulties and setbacks in human pursuits serve a beneficial purpose in teaching that success usually requires sustained effort. Difficulties provide opportunities to learn how to turn failure into success by honing one's capabilities to exercise better control over events. After people become convinced that they have what it takes to succeed, they persevere in the face of adversity and quickly rebound from setbacks. By sticking it out through tough times, they emerge from adversity stronger and more able. (Bandura, 1997b:80)

In this way, situations in which people have direct experiences offer opportunities, through small successes, to strengthen beliefs in one's capabilities. Design Thinking operates within real projects, commonly defined as 'design challenges', where students have to provide a solution to *ill-defined* or *wicked* problems. To build creative self-efficacy, students are guided through several phases in which they apply techniques in order to succeed. The techniques discussed below have been summarized by various authors (Doorley et al., 2018; Dow et al., 2012; Jobst et al., 2012; Kelley & Kelley, 2013; Lewrick, Link, & Leifer, 2018). During the Empathize phase students are trained in a variety of research methods, such as observation, shadowing, or interviewing, in order to learn how to empathize with their users and to understand their needs. In the Define phase,

students learn how to organize and filter their insights by creating personas, empathy maps, HMW (How Might We…?) questions and PoV (Point of View) statements. For the Ideate phase, instruction in brainstorming is provided. This is followed by the Prototype phase, in which prototyping techniques such as sketching, mock-ups, role-playing and user's journeys teach students how to turn ideas into tangible low-resolution artifacts. In the final phase, named Test, students learn how to obtain feedback from users with techniques such as the feedback capture matrix. These specific experiences within real projects enable students to become familiar with methods of Design Thinking. In this way, they acquire the tools and skills to cope with ambiguity, to master design challenges and to succeed.

3.4.2. Vicarious experience

People need additional sources of information apart from enactive mastery experiences to reliably assess their capabilities. For this reason, observing and comparing one's abilities to perform a specific task to equivalents who serve as role models within the same domain constitutes a source of self-efficacy. As Bandura (1997b) further explains:

> More often in everyday life, people compare themselves to particular associates in similar situations, such as classmates, work associates, competitors or people in other settings engaged in similar endeavors. (…) The greater the assumed similarity, the more persuasive are the models' successes and failures. If people see the models as very different from themselves, their beliefs of personal efficacy are not much influenced by the models' behavior and the results it produces. (Bandura, 1997b:87)

This "social learning" (Bandura, 1977:195) thus serves as an important source of self-efficacy, in which modeling is most effective in enhancing efficacy beliefs when individuals see themselves as highly relatable to their role models (Bandura, 1997b). All Design Thinking students are rather similar in their interests since they commonly share an interest in design-oriented approaches. Likewise, Design Thinking strongly encourages students from different disciplines and backgrounds to work together within

the same team. This intra-team diversity permits students to acquire new skills, methods, and knowledge. For such purposes, students must learn how to deal with different knowledge, to make the different domains complementary and to be open to learn from peers. Experience from Potsdam and Stanford shows that the more students relate to their team members, the sooner they begin to complement each other intuitively. Furthermore, teams are required to give several presentations that are open to feedback in each phase of Design Thinking, which allows them to learn from other teams. Furthermore, this distribution of competences facilitates experiences that students would never have had individually. The implementation of the Design Thinking process therefore takes place in a generalized environment in which students help each other within and between teams, where the focus is not on competing against each other, but rather on solving wicked problems or design challenges successfully (Jobst et al., 2012).

3.4.3. Verbal (or social) persuasion

Situations in which an individual verbally expresses to others that they possess the capabilities to successfully perform a given task constitute another important source of self-efficacy. This verbal persuasion often occurs in the form of 'evaluative feedback' (Bandura, 1977:101) provided by peers or facilitators. In addition to external feedback by a third party, self-assurance also positively influences self-efficacy beliefs:

> People who are persuaded verbally that they possess the capabilities to master given tasks are likely to mobilize greater effort and sustain it than if they harbor self-doubts and dwell on personal deficiencies when difficulties arise. To the extent that persuasive boosts in perceived efficacy lead to try hard enough to succeed, self-affirming beliefs promote development of skills and a sense of personal efficacy. (Bandura, 1997b:101)

It is preferable for feedback to be effort-oriented rather than outcome-oriented; that is, recognizing the amounts of effort invested throughout the process further boosts beliefs in one's capabilities compared to feedback focused on the performance itself. Environments for Design Thinking are characterized by offering great support both from facilitators and other teams. Moreover, failure is accepted as a learning process, leading to optimistic attitudes and low levels of fear; statements such as 'fail early and fail often' and 'Yes, we can do it!' are typically verbalized (Jobst et al., 2012:42). For such purposes, a minimum of one facilitator is assigned to each student team, who is actively involved in the project by providing guidance and support throughout the whole project.

3.4.4. Psychological and affective states

Tasks are usually carried out under conditions that can provoke a variety of reactions. People often react physiologically to certain situations (e.g. Aversive arousal, stress, etc.), associating such reactions as signs of dysfunction or undermining performance. Efficacy beliefs are boosted by correcting these misinterpretations of body language in addition to improving people's physical states by reducing stress levels and propensity negativity (Bandura, 1997b).

> People often read their psychological activation in stressful or taxing situations as signs of vulnerability to dysfunction. Because high arousal can debilitate performance, people are more inclined to expect success when they are not beset by aversive arousal than if they are tense and viscerally agitated. Stress reactions to inefficacious control generate further stress through anticipatory self-arousal. By conjuring up aversive thoughts about their ineptitude and stress reactions, people can rouse themselves to elevated levels of distress that produce the very dysfunctions they fear. (Bandura, 1997b:106)

Environmental factors thus strongly influence the way in which one's inner condition is understood. For this reason, Design Thinking sessions at Stanford and Potsdam typically start with warm-up exercises intended to decrease stress levels and negative thoughts in favor of mental relaxation (Jobst et al., 2012). These warm-ups often involve performing simple tasks where students experience success from an initial stage. By improving students' state of mind, they are thought to be more motivated to accomplish design challenges (via endorphin segregation). Likewise, lowering pressure may also contribute to fostering team spirit, as successful milestones encourage social support from the rest of the team members. Therefore, facilitating a comfortable atmosphere in which negative affective states are unlikely to occur is regarded as important for bolstering student efficacy beliefs.

Summary and Conclusions of the Third Chapter

Design-Based Pedagogy (DBP) has emerged as a form of disruptive education that contrasts with the standardized and highly structured approach focused on academic efficiency (Csikszentmihalyi, 2006; Stefani, 2016). In DBP, non-design students gather in multidisciplinary teams in order to solve open-ended problems by addressing them as real challenges (Royalty, 2018). For such purposes, they follow the tools and methods used by designers; that is, the Design Thinking process. Design thinking can thus be defined as a human-centric process aimed at creating innovative solutions to wicked problems by applying the cognitive mechanisms followed by product design engineers. Whilst there is no fixed Design Thinking model, Stanford University's d.school suggests that Design Thinking can consist of five interrelated phases or stages: Empathy, Define, Ideate, Prototype and Test (Doorley et al., 2018; Plattner, 2010).

Amongst its multiple benefits, Design Thinking is thought to help students generate more effective solutions (Melles, Howard, & Thompson-Whiteside, 2012) and to push them to think in different ways (Lugmayr et al., 2014). The literature provides evidence that Design Thinking possesses the potential for positively influencing student creativity, bringing a new body of research that explores the relationship between the two concepts. Specifically, Design Thinking is regarded as beneficial for strengthening students' self-beliefs about their ability to perform creatively (Clark, Stabryla, & Gilbertson, 2020; Dow et al., 2012; Jobst et al., 2012; Royalty & Roth, 2016). In fact, creative self-efficacy can only be achieved by reaching a meta-cognitive level in Design Thinking, which constitutes the highest affective learning-outcome (Wrigley, Mosely, & Tomitsch, 2018:291).

Nonetheless, building creative self-efficacy substantially depends on the four sources of self-efficacy (Puente-Díaz, 2016), which are mastery experiences, vicarious experiences, social persuasion, and affective states (Bandura, 1997b). The tools, methods, and characteristics of Design Thinking can positively influence these four sources (Jobst et al., 2012). However, exploration of the potential benefits of Design Thinking in terms of enhancing undergraduate creative self-efficacy is at an incipient stage, with the scarce

literature reflecting mixed results (Jobst et al., 2012; Ohly, Plückthun, & Kissel, 2017) and limitations regarding the designs of the studies conducted. Therefore, if we are to better understand the role Design Thinking plays in the development of student creative self-efficacy in Higher Education there is a need for more robust research.

PART TWO

METHODOLOGICAL PART

CHAPTER 4

A Spanish Version of the Creative Self-Efficacy Inventory (the CSEI-S)

This fourth chapter constitutes the methodological work of this dissertation and addresses the second research goal stated in the Introduction. We describe the adaptation and validation of Abbott´s original Creative Self-Efficacy Inventory (CSEI; 2010) to the Spanish language (referred to from hereon as the CSEI-S), as a response to the absence of multidimensional instruments for assessing perceived efficacy beliefs about creativity in Spanish. For this purpose, we examined the dimensionality of the inventory by conducting both exploratory and confirmatory factor analyses. Furthermore, we provide evidence of the internal and external validity of the CSEI-S as reliable multidimensional instrument for creative self-efficacy assessment.

Introduction

The assessment of student creativity is regarded as an important challenge that Higher Education institutions have already begun to face (Watts & Blessinger, 2016). Designing tasks and assessment criteria which limit the possibilities of students' responses are creativity inhibitors for both students and teachers (Jackson, 2006a:4). Therefore, the idea of assessing a product in a "formulaic" and "prescriptive" way (Watts & Blessinger, 2016:226) as the culmination of the learning process should be discarded. This shift requires profound changes in assessment strategies (Jackson, 2006a), so that the evaluation of creativity is placed at the same level of content evaluation.

However, creativity assessment has been a problem in the past (Cowan, 2006) due to its multiple limitations and constraints. Research has mostly relied on divergent thinking test batteries to study the underlying cognitive process of creativity. Such tests are good indicators of individual potential to generate a large amount (Fluency) of different (Flexibility) and original (Originality) ideas (Guilford, 1967; Runco & Jaeger, 2012). This might explain why divergent thinking, or the ability to think "in different directions" (Guilford, 1959:470), is usually associated with creativity. Nonetheless, creativity cannot be fully attributed to divergent thinking, as it occurs in combination with convergent thinking, understood as the ability to think in a linear direction seeking one

right solution (Guilford, 1959). In fact, each way of thinking is directly associated to different attributes of a creative product; hence, divergence is required for *novelty*, while convergence is crucial when *appropriateness* is needed. For this reason, educators should be aware of the existing frameworks, and consider the specific purpose and limitations of each of the instruments, in order to avoid inaccuracy (Lemons, 2011). Hence, Lucas, Claxton and Spencer (2012) describe four principles that any tool for assessing creativity should embody: a) Usefulness for teachers; b) Balanced analysis criteria to prevent both abstraction and excessive narrowness; c) Clear and accessible terminology; and d) Features of potential applicability in other kinds of real-world creativity.

The relevance of studying creative self-efficacy has been evidenced by the need to explain human behavior, since it plays an influential role in determining an individual's choices, level of effort, and perseverance in meeting certain objectives. Furthermore, the "lack of clarity" in the way creative self-beliefs have been defined and assessed in the past (Beghetto & Karwowski, 2017:4) have been an obstacle to understanding the role self-beliefs in creative abilities play in influencing creative thinking, performance and identity. In this context, this chapter has two goals. On the one hand, it aims to ad1apt and validate a Spanish version of the original Abbott´s (2010) CSE Inventory (CSEI) as a solution to the absence of multidimensional instruments for assessing creative self-efficacy in Spanish (CSEI-S). On the other hand, we aim to examine the concurrent relationships of the CSEI-S with cognitive styles and personality and to explore mean differences observed across gender.

4.1. The Dimensionality and Assessment of Creative Self-Efficacy

Due to the influence personality plays in creativity, new creativity measurement batteries include self-efficacy items (see Agnoli, Corazza, & Runco, 2016). Since its first conceptualization, creative self-efficacy has traditionally been regarded as a single dimension. Not only did Tierney and Farmer (2002) offer the first official definition of creative self-efficacy as a construct, but they also developed the first instrument to measure it. Thus, creative self-efficacy was measured using the three-item creative self-efficacy scale (e.g. "I feel that I am good at generating novel ideas"), where answers are ranked from 1 to 7 on a Likert scale. Since this formulation, both the construct and the measure have been applied in their original version, and an adapted version has been employed in a variety of fields, such as Business, Psychology and Education, across different cultural settings (see Farmer & Tierney, 2017). Furthermore, Tierney and Farmer's Creative Self-Efficacy Scale (CSE Scale; 2002) is to date one of the most commonly used in creative self-efficacy research, not only in Western culture-based studies but also in Asian contexts (Tang, Hu, & Zhang, 2017).

Nevertheless, there are other less widely used instruments to measure individual creative self-efficacy which have also been proved to be valid; for instance, a three-item scale by Beghetto (2006) (e.g. "I am good at coming up with new ideas,"), a four-item scale by Choi (2004) (e.g. "I feel confident that I can introduce new ideas to the class in a convincing manner,"), the three-item short adjective scale (e.g. "I think I am creative") (2011) and six-item sub-scale (e.g. "I trust in my creative abilities") within the Short Scale of Creative Self (SSCS) measure by Karwowski (2013), and an eight-item measure proposed by Carmeli and Schaubroeck (2007) (e.g. "I am confident that I can perform creatively on many different tasks").

However, within this current conceptualization, creative self-efficacy is not exclusively regarded as a one-dimensional construct, as a new trend within the research community encourages educators to approach such constructs as multidimensional (Tan,

Li, & Rotgans, 2011; Tan, Li, & Neber, 2013). There is evidence that creative self-efficacy is divisible into at least two different dimensions, where one is oriented towards cognition (thinking) and the other towards more practical aspects (performance). Some researchers advocate for new assessment tools in order to better measure creative self-efficacy, critizising that past research has been conducted using one-dimensional scales whose items are general, past-oriented and global (e.g. "I am good at coming up with new ideas") (Beghetto & Karwowski, 2017; Karwowski & Beghetto, 2018; Karwowski, Han, & Beghetto, 2019; Karwowski, Lebuda, & Beghetto, 2019). For this reason, different multidimensional instruments have emerged in recent years aimed at measuring such constructs in a more accurate way.

It must be noted that the emergence of multidimensional creative self-efficacy assessment tools has been particularly noticeable in the Asian context. For instance, in China the creative self-efficacy scale for university students developed by Yang (2007) is comprised of Sensitivity, Flexibility, Originality and Fluency sub-scales. In Singapore, Tan, Ho and Yong (2007) built upon Beghetto's three-item instrument and developed an eight-item measure, with subsequent nine-item (Tan et al., 2008) and ten-item versions (Hill, Tan, & Kikuchi, 2008). Despite the minor variations, these three versions all measure individual CSE by focusing on "cognitive style" and "working style" (Tan & Tan, 2015:123). In a more recent study, Tan, Li and Rotgans (2011) further developed previous two-dimensional measures by creating a new Multidimensional Creativity Self-Efficacy Scale (MSCE) consisting of five sub-scales and 29 items; while "working style" is inherited from the original scales, "idea generation", "concentration", "tolerance of ambiguity" and "independence" are introduced in this new measure. Lastly, Taiwan, Hung and Lin (2005) developed a three-dimensional creative self-efficacy scale and validated it some years later (in 2018) in a sample of over 1,400 Taiwanese students (Hung, 2018). The revised 12-item version of this measure assesses student Efficacy in Creative Thinking, Efficacy in Creative Production and Persistence of Efficacy.

In a similar line, in a Western cultural setting Abbott (2010), developed a new theoretical model of creative self-efficacy where the construct was split into "Creative Thinking Self-Efficacy" (CTSE) and "Creative Performance Self-Efficacy" (CPSE) dimensions. His research and follow up dissertation resulted in the Creative Self-Efficacy Inventory (CSE Inventory), a two-dimensional measure comprised of seven factors. The first dimension, the CTSE, includes the four main components of Torrance's Divergent Thinking (Fluency, Flexibility, Originality and Elaboration), while the second dimension, the CPSE, consists of the three components of the Systems Model (Personality, Domain and Field) proposed by Csikszentmihalyi (1999). After several iterations, both 28-item "All Model" and 21-item "Revised Model" versions of the CSE Inventory proved to be reliable methods of assessing individual creative self-efficacy through the seven factors mentioned above. Abbott's CSE Inventory, as well as being used in its original version (Vally et al., 2019), has been translated into Arabic and validated by Alotaibi (2016), successfully passing reliability tests.

Creative self-efficacy is divisible into different self-efficacies, according to its multidimensional nature (Abbott, 2010; Alotaibi, 2016; Hung, 2018; Tan, Li, & Neber, 2013), and its relevance has been demonstrated by the emergence of multidimensional creative self-efficacy assessment instruments that are available in the world's most spoken languages, including English, Chinese and Arabic. According to the most recent data available (early 2020), Spanish is the second language with most speakers and is the fourth most spoken language in the world (Ethnologue, 2020). Research in an educational context has been carried out in Spanish-speaking areas using Tierney and Farmer's three-item measure in its original version (Puente-Diaz & Arroyo, 2016; Puente-Díaz & Cavazos-Arroyo, 2017b). Moreover, the Spanish version of this scale has been adapted and validated by Aranguren, Oviedo and Irrazábal (2011). Nonetheless, to date there is no instrument to reliably measure self-beliefs about one's creative abilities beyond a single dimension in the Spanish language. Developing a new multidimensional tool in Spanish or adapting and validating an existing one is therefore necessary.

The relevance of studying creative self-efficacy has been manifested by the need to explain human behavior, since it plays an influential role in determining an individual's choice, level of effort, and perseverance in meeting certain objectives. Furthermore, the "lack of clarity" in the way creative self-beliefs have been defined and assessed in the past (Beghetto & Karwowski, 2017:4) does not help to understand the role self-beliefs about creative abilities play in influencing creative thinking, performance and identity. As mentioned earlier, the CSEI (Abbott, 2010) has a seven-factor structure grouped into two dimensions: the first dimension, called Creative Thinking Self-efficacy (CTSE), is constituted by *Fluency* (the ability to generate a great number of ideas), *Flexibility* (the ability to change direction or modify ideas), *Originality* (the ability to produce something that is unique and genuine) and *Elaboration* (the ability to build upon ideas by filling them out with details) (Guilford, 1967; Penagos & Aluni, 2000). The second dimension, called Creative Performance Self-Efficacy (CPSE), consists of *Personality* (the talents and experiences of a person), *Domain* (knowledge, tools, values and practices within a culture) and *Field* (the panel of experts and practitioners within the domain) (Csikszentmihalyi, 1999).

4.2. The relationship of Creative Self-Efficacy with Cognition, Personality, and Gender

a) Cognition

Creative thinking is a combination of both divergent thinking and convergent thinking (Madrid & Patterson, 2016; Ren, Yang, & Qiu, 2019; Soroa et al., 2015). Research in the past has relied on divergent thinking tests to study the underlying cognitive process of creativity (though not creativity itself), and such tests are indeed good indicators to estimate an individual´s potential to generate a large amount (Fluency) of different (Flexibility) and original (Originality) ideas (Runco & Jaeger, 2012). In addition, Need for Cognition has been found to affect individual creativity in a statistically significant way (Hahn & Lee, 2017), suggesting that individuals who like

thinking show greater creativity. However, self-perceptions of creativity and self-efficacy correlate more in the case of individual characteristics (defined as creative person) than in that of cognitive abilities (defined as creative process) (Haase et al., 2018). This may explain why various authors (Hung, 2018; Pretz & Nelson, 2017; Puente-Díaz, 2016; Puente-Díaz & Cavazos-Arroyo, 2017b) have found no significant correlations between CSE and divergent thinking scores. Other authors only partially explain this relationship, by correlating CSE with a limited number of divergent thinking dimensions, such as ideational Fluency (Hass, Katz-Buonincontro, & Reiter-Palmon, 2016; Reiter-Palmon et al., 2012) and Originality (Puente-Díaz & Cavazos-Arroyo, 2017a). Others report that CSE is a predictor for divergent thinking (defined as creative performance) in the workplace (Jaussi, Randel, & Dionne, 2007; Richter et al., 2012; Tierney & Farmer, 2002, 2004, 2011) as well as in education (Beghetto, 2006; Beghetto, Kaufman, & Baxter, 2011; Sanz de Acedo, Sanz de Acedo, & Closas, 2014).

b) Personality

Personality as a construct plays an important role in the study of creativity (Feist, 1999:289). For this reason, research concerning creative personality explores specific traits in individuals known to have high creative potential, working on the presumption that some basic dimensions of personality are positively related to creativity (Li et al., 2014). The literature suggests that Openness, in addition to Extraversion, are the personality traits that best predict creativity within the Big Five model, while Neuroticism is negatively correlated to creativity (Agnoli, Corazza, & Runco, 2016; Baer et al., 2008; Batey, Furnham, & Safiullina, 2010; Chamorro-Premuzic & Reichenbacher, 2008; Feist, 1998, 2019; Hughes, Furnham, & Batey, 2013; Kienitz et al., 2014; Silvia et al., 2009; Zare & Flinchbaugh, 2019). As with creativity, CSE appears to have the strongest positive relation to Openness to experience and Extraversion, as well as a strong negative relation to Neuroticism (Batey & Hughes, 2017; Hsu, Hou, & Fan, 2011:, 2013 #163). Additionally, results by Karwowski et al. (2013) specifically suggest potential gender differences in Extraversion and Conscientiousness; women showed higher levels of CSE

when scoring higher in Extraversion, while men showed higher CSE levels when scoring higher in Conscientiousness.

c) Gender

Baer & Kaufman (2008) reported no statistically significant differences in creativity between males and females after reviewing more than 78 studies involving different creativity measurement instruments. Similarly, the relation between CSE and gender is still unclear. Some authors have found no significant differences between women and men (Beghetto, Kaufman, & Baxter, 2011; Haase et al., 2018; Hung, 2018; Kerr, 2009; Maslak, 2019), while others have reported higher CSE scores in men than in women producing the same amount of ideas, suggesting an underestimation of creative self-capabilities by females (Brockhus et al., 2014; Karwowski, 2011). Finally, results (Karwowski, Gralewski, & Szumski, 2015) concerning the academic domain are also mixed; creative self-efficacy levels have been shown to be higher among males in subjects requiring convergent thinking (e.g. math), while they were higher among women in subjects requiring divergent thinking, such as languages.

4.3. Method

4.3.1. Participants

The original sample consisted of 487 subjects, but 14 of these were excluded, resulting in a total of 473 subjects (347 female and 126 male) aged between 18 and 25 years old (M_{age} = 20.66; *SD* = 1.65). Participants were studying in two different universities located in the Basque Country (northern Spain): 56.7% were students at Mondragon University (MU) and 43.3% were studying at University of the Basque Country (UPV/EHU). We employed non-probability convenience sampling and we strove to balance different academic domains: 43.34% of subjects were Psychology undergraduates, 32.98% were Teacher trainees (Infant and Primary Education), and 23.68% were Communication Studies undergraduates. A detailed classification of the participants according to their institution, bachelor's degree, and gender is provided in Table 1:

Table 1

Characteristics of the Research Sample according to Institution, Bachelor's Degree, and Gender

	Teacher training		*Communication Studies*	*Psychology*	*Gender*	
	Infant	Primary			Male	Female
Mondragon University (MU)	61	95	68	-	99	169
Public University of the Basque Country (UPV/EHU)	-	-	44	205	27	178
Subtotal	156		112	205	126	347
Total (N=473)						

The study followed the ethical guidelines of the Spanish Psychological Society, and we selected students who expressed a wish to participate in this study voluntarily.

4.3.2. Instruments

- A Spanish version of Abbott's Creative Self-Efficacy Inventory (the CSEI-S). The CSEI-S is a 26-item self-report questionnaire divided into seven dimensions: Fluency (e.g. *"Genero una gran cantidad de ideas"* / "I have a large number of ideas"), Flexibility (e.g. *"Las ideas que se me ocurren suelen ser diferentes entre sí"* / "My ideas tend to be different"), Elaboration (e.g. *"Asocio mis nuevas ideas o sueños a cosas que ya he aprendido"* / "I associate new ideas or dreams to things I have already learned"), Originality (e.g. "Tengo ideas originales que el resto no tiene" / "I have original ideas that others do not have"), Domain (e.g. *"Aprendo por mí mismo/a a hacer algo nuevo"* / "I learn how to do something new by myself"), Field (e.g. *"Suelo convencer a otras personas de haber hecho una contribución valiosa"* / "I usually convince others that I have made a valuable contribution"), and Personality (e.g. *"Soy capaz de motivarme para generar nuevas ideas"* / "I am capable of motivating myself to come up with new ideas"). Items are responded to on a 6-point Likert scale, with options ranging from 1 (Strongly disagree) to 6 (Strongly agree). The items of the CSEI-S are shown in Appendix 1.

- Creative-Self-efficacy Scale (CSE Scale; Tierney & Farmer, 2002). To assess perceived capacity for creative work, we used the three-item scale developed by Tierney and Farmer, which incorporates a 6-point Likert scale from 1 (Strongly disagree) to 6 (Strongly agree). A sample item was *"Confío en mi habilidad para solucionar los problemas creativamente"* / "I have confidence in my ability to solve problems creatively". This short scale has been shown to have suitable psychometric properties ($\alpha = .75$).

- The Emotion/motivation-related Divergent and Convergent thinking styles Scale (EDICOS; Soroa et al., 2015). EDICOS is a 30-item self-report questionnaire that provides information about consistent individual differences in emotional and motivational reactions to divergent and convergent thinking. EDICOS is composed of four factors, of which we have selected the following: Convergent-preventive style (e.g. *"Considero interesante reflexionar sobre los problemas"* / "I consider it interesting to reflect on problems"), and Divergent-proactive style (e.g. *"Me interesa participar en retos originales"* / "I am interested in participating in original challenges"). Items are answered using a 6-point Likert scale, with options ranging from 1 (Strongly disagree) to 6 (Strongly agree). The two abovementioned dimensions showed adequate internal consistency with Cronbach's alpha values of .86 and .84 respectively. Correlation indices for both dimensions between the test and the retest were also adequate: .68 (convergent-preventive) and .65 (divergent-proactive).

- A reduced Spanish version of the Need for Cognition Scale (NC; Falces et al., 2001). The reduced Spanish NC measures the extent to which individuals are motivated to think. Confirmatory factor analysis supports a two factor structure composed of: a positive factor related to the tendency to make a mental effort (Preference for cognition: e.g. *"Me atraen más los problemas muy complejos que los sencillos"* / "I am more attracted by highly complex problems than by simple ones"); and a negative factor related to the tendency to avoid and reject situations requiring sustained mental effort (Avoidance of cognition: e.g. *"Prefiero pensar el mínimo necesario en cada caso"* / "I prefer to think as little as possible in each case"). The NC has 18 items (9 items per subscale) with options ranging from 1 (Totally disagree) to 5 (Totally agree). In the present study Preference and Avoidance dimensions presented Cronbach's alpha values of .84 and .76. respectively.

- The Spanish version of the Revised-Abbreviated Eysenck Personality Questionnaire (Spanish EPQR-A; Sandín et al., 2002). Personality was measured using 24 items divided into three dimensions of the Spanish EPQR-A: Neuroticism (e.g. *"Tengo con frecuencia subidas y bajadas en mi estado de ánimo"* / "I frequently experience mood changes"), Extraversion (e.g. *"Soy una persona habladora"* / "I am a talkative person"), and Psychoticism (*"Tomaría drogas que pudieran tener efectos desconocidos o peligrosos"* / "I would take drugs that could have unknown or dangerous effects"). Items are responded to on a 6-point Likert scale ranging from 1 (Strongly disagree) to 6 (Strongly agree). In this study, Neuroticism, Extraversion, and Psychoticism showed adequate psychometric properties.

4.3.3. Procedure

The Spanish version of Abbott's CSE Inventory, referred to CSEI-S, was developed using a forward-backward translation procedure based on international guidelines (Balluerka et al., 2007; Hambleton & Patsula, 1999).

Each of the original English items was independently translated into Spanish by two bilingual researchers of the University of the Basque Country (UPV/EHU), who were familiar with both languages and cultures. The two versions were compared and discussed to obtain an agreed version for each of the items in Spanish. Next, two researchers from Mondragon University (MU) independently translated the proposed Spanish items back into English, and arrived at a consensus about the accuracy of the CSEI-S. Finally, all four translators jointly compared each of the original items of Abbott´s CSE Inventory with the items of the inversely adapted version, to rule out any potential non-equivalence in meaning. During this analysis, three main changes were made to the Spanish version of the CSEI.

- In order to facilitate understanding of the items, so that participants could identify more easily with each one, we transformed the interrogative style of the English version into an affirmative style (direct items) in the Spanish version. For example, item 25, "Be motivated to come up with new ideas?" was replaced by "I tend to be motivated to generate new ideas". In this way, the new items were converted into first person.

- As some of the original English words sound complex when translated to Spanish, less complex expressions were used in Spanish (e.g. Item 19 "Teach yourself" was replaced by "I learn myself"; Item 23 "Network with people" was replaced by "I work with others"; Item 27 "Wake up feeling like" was replaced by "I feel like"; Item 28 "Working for years or decades" was replaced by "Working for a long time").

- Once the contents of the items had been agreed upon, it was decided to change the response scale from 0-100 to 1-6 to avoid dispersion and the mid-point of the scale (Martínez Arias, 2006).

With this preliminary version, a pilot study was conducted in order to obtain information about the functioning of items and to review the formal aspects of the questionnaire. 99 students (56 female and 43 male) from the University of the Basque Country (UPV/EHU), aged between 18 and 22 years (M_{age} = 19.13; SD = 1.21), participated in this part of the project. With the aim of obtaining a group of items that maximized the variance of the questionnaire and to increase the internal consistency of each dimension, we selected items with homogeneity indexes higher than .40 in the corresponding dimension. Moreover, a qualitative analysis of the items was conducted, based on the suggestions of students regarding their difficulties in understanding. When responding, the participants indicated that some items were more difficult to answer compared to others; specifically, item 9 and items 20-21-22.

After examining their suggestions, items 21-22 were reformulated. Considering that the homogeneity indexes of items 9 and 20 were lower than .30, and that participants did not understand them correctly, it was decided to remove them. After implementing the changes resulting from the pilot study, the CSEI-S was applied to a larger sample of participants, along with the other questionnaires required for its validation (Tierney & Farmer's CSE Scale, EDICOS, NC, and Spanish EPQR-A). The questionnaires were answered, and data were collected by two researchers during the students' usual class timetable, in their usual classrooms. Informed consent was obtained from the corresponding educational authorities, as well as from the students themselves.

4.3.4. Data Analysis

The analysis was performed using SPSS v25. First, the dimensionality of the CSEI-S was explored using an exhaustive cross-validation procedure (Refaeilzadeh, Tang, & Liu, 2009)), by which the total sample was randomly dividing into two subsamples. The first subsample (the exploratory subsample) was used to explore the dimensionality of CSEI-S and consisted of 233 participants (72.1% female and 27.9% male) with a mean age of 20.13 (*SD* = 1.92). The second sample (the validation subsample) was used to test the previous model and consisted of 240 participants with a mean age of 21.1 (*SD* = 1.47), of which 65.4% were female. An exploratory factor analysis was performed on the exploratory subsample using the principal axis factoring procedure with orthogonal rotation to extract the underlying structure of the participants´ responses to the 26 items. The Parallel Analysis (Velicer, 1976) procedure was used to determine the number of components. Next, a confirmatory factor analysis of the validation subsample was performed to determine whether the structure was replicable using SPSS Amos v25.0. The goodness-of-fit indices employed were: $\chi 2/df$ (Chi-square likelihood ratio statistic), CFI (Comparative Fit Index), TLI (Tucker Lewis Index), and RMSEA (Root Mean Square Error of Approximation). In the case of the CFI and TLI, values above .90 indicate acceptable fit. For the RMSEA, values below .08 indicate acceptable fit and those below .06 a good fit (Hu & Bentler, 1999). Values equal to or

higher than .95 for CFI and TLI and below .06 for RMSEA were considered indicative of a good fit (Schreiber et al., 2006).

To assess the reliability of CSEI-S scores in terms of internal consistency we calculated both the Cronbach's Alpha and Composite Reliability coefficients for the 7 factors of the inventory. Moreover, the temporal stability of the CSEI-S scores was evaluated by means of the test-retest procedure, employing the instrument once again in a smaller subsample of 92 participants (53.3% female and 46.7% male) aged between 18 and 24 years old (M_{age} = 21.01; *SD* = 1.12). The two test administrations were separated by a 16-week interval.

Subsequently, to obtain evidence of external validity, Pearson coefficients were used to analyze correlations between the sub-scales of CSEI-S and other sub-scales related to self-efficacy (CSE Scale; Tierney & Farmer, 2002), Emotional Divergent-Convergent thinking (EDICOS; (Soroa et al., 2015), Need for Cognition (NCS; Falces et al., 2001), and Personality (Spanish EPQR-A; Sandín et al., 2002).

Finally, we assessed whether there were gender differences in creative self-efficacy dimensions by using a Student's *T*-test. Cohen´s *d* index was employed to estimate the effect size with respect to the difference between the two mean scores.

4.4. Results

4.4.1. Dimensional Structure

As we have described in the data analysis section, an exploratory factor analysis was conducted for the exploratory subsample (N = 233). First, the sample bias of the 26 items was measured via diagonal analysis of the correlation matrix. The Kaiser–Meyer–Olkin index (KMO = 0.92) and Bartlett's sphericity test (χ^2_{325}, N = 233 = 3186.884, $p <$ .001) indicated the data matrix's suitability regarding the factorial analysis requirements. Next, the Parallel Analysis procedure recommended extracting 7 factors that explained 69.82% of the total variance. Using .40 as the cut-off point for the factor loadings, the 26 items were assigned to their corresponding factors.

To check the fit of the seven-factor model in the exploratory subsample, a confirmatory factor analysis was conducted for the validation subsample (N = 240). Most of the indices calculated revealed an acceptable fit for the orthogonal seven-factor model: The quotient of chi-square over degrees of freedom was 2.45 (χ^2_{278}, N = 240 = 682.92, p < .001); CFI was .92; TLI was .90; and RMSEA was .05. All these statistics indicated an adequate fit. Table 2 shows the fit indices of the other models tested (two-dimensional and one-dimensional), which were not as good.

Table 2.

Fit Indices for the CSEI-S of the Three Different Models Tested.

Model	Factors	Items	χ^2 (df)	CFI	TLI	RMSEA
One-dimensional (1 factor)	Creative Self-Efficacy	26 items	2017.511 (299)**	.689	.634	.11
Two-dimensional (2 factors)	Creative Thinking Self-Efficacy	15 items	1914.003 (298)**	.70	.65	.10
	Creative Performance Self-Efficacy	11 items				
Multidimensional (7 factors)	Fluency	4 items	682.92 (278)**	.927	.908	.055
	Flexibility	4 items				
	Elaboration	3 items				
	Originality	4 items				
	Domain	3 items				
	Field	4 items				
	Personality	4 items				

χ^2, Chi-squared; df, degrees of freedom; CFI, comparative fit index; TLI, Tucker-Lewis index; RMSEA, Root Mean Square Error of Approximation.

** p< .001

4.4.2. Reliability

Cronbach's Alpha and Composite Reliability coefficients are shown in Table 3. Cronbach's Alpha coefficients ranged between .69 and .88, whereas Composite Reliability coefficients ranged between .55 and .78. The test-retest correlation coefficients (Pearson) ranged between .43 and .63 (see Table 3).

Table 3.

Reliability Indices of the CSEI-S

Dimension	Mean (SD)	Cronbach's Alpha	Composite Reliability (CR)	Test-Retest Correlation
Fluency	16.47 (3.02)	.78	.68	.56**
Flexibility	15.99 (2.84)	.80	.59	.43**
Elaboration	12.81 (2.51)	.69	.55	.49**
Originality	13.28 (3.88)	.88	.78	.63**
Domain	13.34 (2.44)	.76	.68	.52**
Field	13.55 (3.39)	.78	.71	.53**
Personality	17.79 (3.36)	.80	.78	.60**

** $p < .001$

4.4.3. Association of CSEI-S dimensions with one-dimensional Creative Self-Efficacy, Emotional Divergent-Convergent Thinking, Need for Cognition, and Personality

Table 4 shows the correlations between the dimensions of the Spanish CSEI (the CSEI-S) and the dimensions of Tierney and Farmer's CSE Scale, EDICOS, NC and EPQR-A.

Table 4.

Correlations between the Dimensions of the CSEI-S and those of Tierney and Farmer's CSE Scale, EDICOS, NC and EPQR-A.

	Tierney and Farmer's CSE	*Emotional Divergent-Convergent Thinking (EDICOS)*		*Need for Cognition (NC)*		*Personality (EPQR-A)*		
	CSE	Convergent-preventive	Divergent-proactive	Preference for Cognition	Avoidance of Cognition	Neuroticism	Extraversion	Psychoticism
Fluency	.66**	.38**	.53**	.50**	-.16**	-.05	.25**	.13**
Flexibility	.60**	.34**	.56**	.44**	-.06	-.04	.14**	.14**
Elaboration	.45**	.23**	.43**	.39**	-.09	-.02	.20**	.05
Originality	.65**	.21**	.50**	.43**	-.01	-.11*	.20**	.07
Domain	.44**	.50**	.46**	.55**	-.22**	-.09	.13*	.078
Field	.42**	.19**	.36**	.33**	.07	-.03	.17**	.08
Personality	.59**	.41**	.66**	.56**	-.12*	-.06	.26**	.13**

*p < .05; **p < .001.

Creative Self-Efficacy showed a strong correlation with Fluency, Flexibility, Originality and Personality when measured using Tierney and Farmer's CSE Scale (r = .66, .60, .65 and .59 respectively; $p < .001$), while a moderate correlation was found with Elaboration, Domain and Field (r = .45, .44 and .42 respectively; $p < .001$).

The *Convergent-preventive* style of EDICOS correlated strongly with Domain (r = .50; $p < .001$), which was followed by Personality (r = .41; $p < .001$). *Divergent-proactive* style correlated with all seven factors of CSEI-S, with Personality proving to be the dimension with the strongest correlation (r = .66; $p < .001$) and Field that with the weakest correlation (r = .36; $p < .001$).

Regarding the dimension Need for Cognition (NC), we found that *Preference for Cognition* correlated with all seven factors to an intermediate extent (correlations of .33 - .56), while *Avoidance of Cognition* did not correlate significantly with any of the CSEI-S dimensions, with the exception of Domain and Fluency (r = .22 and .16; $p < .001$).

With respect to the personality dimensions measured by the Spanish EPQR-A, Neuroticism did not correlate significantly with any of CSEI-S's dimensions. Psychoticism correlated only with Fluency and Personality, with a small effect size (r = .14; $p < .001$). Extraversion correlated with all 7 factors of CSEI-S, though the correlation indexes were of a small size (among .13 - .26).

4.4.4. Differences in Creative Self-Efficacy across Gender Groups

As can be seen in Table 5 there were significant differences between females and males regarding Originality and Field factors. The men's score (M = 13.84; SD = 3.89) was higher than that of females (M = 13.05; SD = 3.86) in the Originality dimension (t_{418} = 1.904; $p < .05$). This difference had a small effect size (Cohen´s d = 0.20). In the Field dimension men's scores (M = 14.68; SD =3.1) were also higher than those obtained by females (M = 13.09; SD = 3.41), with a medium effect size observed (Cohen´s d = 0.47). No significant differences were found for the other dimensions.

Table 5.

Mean Differences between Females and Males in relation to CSEI-S Scores.

	Females (N = 347)		Males (N = 126)		*t (df)*	Effect Size *d* (95% CI)
	M	*SD*	*M*	*SD*		
Fluency	16.55	3	16.27	3.07	.855 (417)	0.09 (0.11-0.29)
Flexibility	16.04	2.91	15.88	2.68	.505 (418)	0.05 (0.14-0.26)
Elaboration	12.91	2.56	12.58	2.37	1.22 (418)	0.13 (0.07-0.33)
Originality	13.05	3.86	13.84	3.89	-1.904 (418)*	0.20 (0-0.4)
Domain	13.44	2.46	13.10	2.41	1.29 (418)	0.14 (0.06-0.34)
Field	13.09	3.41	14.68	3.1	-4.43 (416)**	0.47 (0.27-0.68)
Personality	17.96	3.29	17.38	3.48	1.62 (418)	0.17 (0.03-0.37)

*p < .05; **p < .001.

Summary and Conclusions of the Fourth Chapter

The assessment of creative self-efficacy constitutes a topic of interest for discussion within the literature. Whilst originally conceived as a one-dimensional construct, creative self-efficacy has proved to be divisible into different types of self-efficacy (Abbott, 2010; Alotaibi, 2016; Hill, Tan, & Kikuchi, 2008; Tan, Ho, & Yong, 2007; Tan et al., 2008; Tan, Li, & Rotgans, 2011; Tan, Li, & Neber, 2013; Tan & Tan, 2015). Such multidimensional conceptions of creative self-efficacy endorse the need for using suitable multidimensional instruments to reliably measure self-judgment about individual creative abilities. Furthermore, the lack of instruments aimed at assessing creative self-efficacy beyond a single dimension in the Spanish language advocates the need for developing a multidimensional creative self-efficacy instrument in Spanish.

We adapted and validated a Spanish version of Abbott's (Abbott, 2010) Creative Self-Efficacy Inventory (the CSEI-S) by evaluating its psychometric properties in a large sample of Higher Education students. Our CSEI-S comprises 26 items distributed across seven dimensions (two of the original items were eliminated). In light of the debate regarding the dimensionality of the CSE, a one-dimensional model, a two-dimensional model and a multidimensional (seven-factor) model were all tested, and the latter was found to have the best fit. For our purposes, the factors of Fluency, Flexibility, Elaboration and Originality in Abbott's (2010) creative self-efficacy theoretical model were replicated on the one hand, and those of Domain, Field, and Personality on the other found, and all seven were combined multidimensionally. The CSEI-S was shown to be reliable, as suitable indexes of internal consistency and temporal stability were obtained for all seven dimensions.

In a second phase of this experiment, we examined the concurrent relationships of the CSEI-S with cognitive styles and personality and explored mean differences observed across gender. An external validity analysis of the instrument corroborated the results reported in the literature (Jaussi, Randel, & Dionne, 2007; Sanz de Acedo, Sanz de Acedo, & Closas, 2014; Tierney & Farmer, 2002, 2004, 2011). All subscales of CSEI-S correlated with Divergent-proactive dimension of EDICOS and the Thinker style of NC. However, Domain was found to correlate more strongly with the Convergent-

preventive dimension of EDICOS and the Nonthinker style of NC. These results are consistent with the need for both divergent and convergent thinking noted previously by Madrid & Patterson (2016) and Ren, Yang, & Qiu (Hsu, Hou, & Fan, 2011; 2019. As regards the relationships between the 7 dimensions of the CSEI-S and Big Five personality traits, the results are in line with those of other authors who found an association between Extraversion (EPQR-A) and Fluency, Elaboration, Originality and Personality {Batey, 2017 #219).

We found no significant differences between female and male students in five of the 7 dimensions, and the effect sizes for these comparisons were small, reflecting those found in the literature (Baer & Kaufman, 2008; Beghetto, 2006; Haase et al., 2018; Kerr, 2009; Maslak, 2019). However, with respect to the Originality and Field dimensions, males scored slightly higher than females, with medium effect sizes being noted. These results are in line with those of Brockhus et al. (2014), Hung (2018) and Karwowski (2011), who suggest a potential underestimation of creative capabilities by female students, despite producing the same amount of ideas as males.

Limitations of the Study and Future Research

One of the limitations of the present chapter concerns the use of self-report measures solely, in that the results may be affected by single-method bias. In addition, all the participants came from the same region (the Basque Autonomous Community) and were selected from only three-degree courses (Psychology, Education or Communication). Future studies should employ other types of measures and recruit more heterogeneous samples from other Spanish-speaking areas. In order to generalize the findings of this study, it would be of interest to examine creative self-efficacy results in other populations, including Higher Education students from science and technology disciplines.

In summary, this chapter demonstrates that the CSEI-S has satisfactory psychometric properties and may help to explain individual differences in dimensions comprising creative self-efficacy. Moreover, we believe the CSEI-S could be beneficial from a research perspective; for example, in the evaluation of intervention programs focused on creative-thinking criteria, such as Fluency, Flexibility, Elaboration and Originality, and of those concerning creative-performance, which explore Domain, Field and Personality.

PART THREE

EMPIRICAL PART

CHAPTER 5

Design, Implementation and Evaluation of the IACF Intervention Program

The third part of this research work constitutes the empirical part of the project. Thus, the fifth chapter is devoted to how we met the third research goal specified in the Introduction. For this purpose, in this chapter we will first describe the design and implementation of a Design Thinking-based intervention program called “Innovative Audiovisual Contents and Formats" (IACF), and will then evaluate its effectiveness by using primarily the CSEI-S to measure and compare the creative self-efficacy of fourth year Communication Studies undergraduates at Mondragon University before and after completion of the program.

Introduction

The development of educational programs aimed at helping students develop their creativity has been amongst the most important goals of educational systems over the past decades (Elisondo, Danolo, & Rinaudo, 2011; Karkockiene, 2005). As already mentioned in previous chapters, self-efficacy is commonly defined as the judgment about one’s ability to plan and successfully perform a given task (Bandura, 1997b). These perceived beliefs shape human behaviors (Sesen, 2013), and it is known that creativity is influenced by self-efficacy (Hahn & Lee, 2017). In this context, students with very similar creative skills might perform very differently depending on their efficacy beliefs (Bandura, 1997b). Therefore, creative self-efficacy has become a relevant construct within creativity research in Higher Education due to its implications for education.

Self-beliefs about students’ creativity have been broadly studied in different educational stages, proving to be positive in various aspects of the learning experience. Since self-efficacy mediates and predicts students’ learning, accomplishments and motivation (Van Dinther, Dochy, & Segers, 2011), it seems essential for Higher Education institutions to pay attention to its development. Creative students with high self-efficacy are more likely to attempt creative tasks and persist when encountering difficulties, whereas students with low creative self-efficacy tend to opt for the easiest solution, or eventually give up in the face of difficulties (Bandura, 1997a; Starko, 2014).

Educators seek the most effective way to promote the creative self-efficacy of undergraduates. The present chapter explores whether Design Thinking is an effective training approach for developing student creative self-efficacy based on two main principles: on the one hand, being a human-centric problem-solving process, Design Thinking possesses a natural link to creativity owing to the strong association between high empathy and creativity (Da Costa et al., 2015); on the other hand, Stanford's d.school was specifically conceived with the goal of enhancing student creative self-efficacy using the Design Thinking process (Royalty, 2018).

5.1. Assessment of the Influence of Design Thinking on Student Creativity

Developing undergraduates' self-beliefs about their own creativity is amongst the biggest educational goals of universities (Jackson, 2006b). Previous research has provided evidence that creative self-efficacy (in addition to creative performance) can be fostered in Higher Education through creativity training courses or programs (Alzoubi et al., 2016; Byrge & Tang, 2015). Research conducted at Stanford University specifically identified Elaboration as the most influenced component of divergent thinking, with students obtaining higher scores after undergoing a 5-week Design Thinking training program (Kienitz et al., 2014). Furthermore, the highest improvement in Elaboration was detected in participants scoring high in Extraversion, suggesting that personality acts partially as a moderator. Overall, the results indicated that Design Thinking facilitates the generation of more genuine and detailed responses to a problem-solving task.

As with research in creativity assessment, investigators have found it challenging to measure the influence of Design Thinking on student creativity within educational contexts, and so several instruments have been specifically designed for such a purpose. For instance, there has been an attempt to develop and validate a Design Thinking Creativity Test (DTCT) at Stanford University. The DTCT was specifically conceived to measure the extent to which individuals apply their creativity while solving a wicked problem by means of the Design Thinking process (Hawthorne et al., 2016; Saggar et al., 2015). The authors acknowledged that more robustness is needed in order to use it as a standardized instrument, since it did not successfully pass the preliminary reliability tests. Nonetheless, Design Thinking research in educational contexts has generally been carried

out using self-report instruments. The Creative Agency and Confidence Questionnaire (CACQ) was also developed at Stanford University by Royalty and colleagues (2014), and has been used in order to measure student confidence levels in relation to their creative abilities after undergoing a design-thinking based experience (e.g. a workshop, also known as a 'bootcamp'). As a result of such self-report questionnaires, it is now known that Design Thinking does not only seem to benefit student creativity, but also their efficacy beliefs. This is evidenced in research conducted by Clark, Stabryla and Gilbertson (2020), who found a positive relationship between Design Thinking and self-perceptions of creativity among engineering undergraduates. Similarly, studies conducted at Stanford University suggest that Design Thinking significantly enhances student creative confidence (Dow et al., 2012; Jobst et al., 2012) and creative agency (Royalty & Roth, 2016), both of which constructs are very closely related to creative self-efficacy (Brockhus et al., 2014).

Apart from the previously mentioned studies conducted at Stanford University, little research has been carried out to examine the potential benefits of the Design Thinking process for the creative self-efficacy of Higher Education undergraduates. One of the few studies performed to date was conducted in Germany by Ohly, Plückthun and Kissel (2017). A university course was structured according to the five stages of the Design Thinking process used at Stanford University, with the purpose of teaching students a systematical process for the generation of novel solutions to real problems. A comparison of pre-and post-test data revealed no statistically meaningful improvement in the creative self-efficacy of the participating students (t=1.53; p =0.13, d=0.23) (Ohly, Plückthun, & Kissel, 2017). The authors hypothesized that a lack of sufficient time for students to work on their ideas, in addition to potential problems within teams, had acted as inhibitory factors. In this sense, providing students with enough time to think is regarded as an important aspect when aiming to unleash their creativity. As Reisman (2016:35) points out, time for "reflection, visualization and meditation" is highly valued in Higher Education; by giving students time to complete a task, they have the opportunity to think about the human and material resources available and interact with them (Dolšak & Hillyard, 2016) in order to find a solution, and, thus, creativity can flourish. When teaching creatively, students should be provided with the adequate time and space in order

to explore their interests, to value their strengths and to experiment according to their preferences (James, 2016), because all of this will increase their motivation. Furthermore, such a boost to student's motivation is associated, not only with creativity, but also with meaningful learning (Starko, 2014). Overcoming any kind of blocking process or burden is therefore essential if creativity is to flourish (James, 2016).

5.2. The 'Innovative Audiovisual Contents and Formats' (IACF) Intervention Program

The IACF was conceived within the Department of Communication Studies of Mondragon University in view of the relevance of young people's creative self-efficacy at the educational and social levels and the lack of university initiatives for promoting its development.

5.2.1. Objectives of the IACF program

The principal aim of the IACF program is to promote Communication Studies students' self-beliefs regarding their creative abilities. For this purpose, students in their fourth and last year of Communication Studies at Mondragon University worked in teams to create an innovative audiovisual content or format. Nonetheless, the intervention program has other specific learning outcomes inherent to the curriculum of the Communication Studies Bachelor's degree. These are:

- To identify different narratives and to adapt them to the production of innovative formats, considering the current situation of the audiovisual field.
- To create and direct innovative audiovisual formats and content, according to the corresponding narrative and technical criteria (space, time, rhythm, sound and diegesis).
- To coordinate the human resources needed to produce innovative audiovisual formats and contents.
- To plan the production of innovative audiovisual formats, according to the necessary technical resources.

- To analyze today's society and to determine the most important social changes in recent years.
- To reflect upon the current state of the sphere of information and communication, in the light of recent developments
- To interpret new texts and ideas in the current context.
- To determine the processes, resources and techniques used for directing and managing audiovisual companies, and to analyze them within their industrial structure.
- To simulate the setting up of an audiovisual company whose aim is to make and market a specific product or service.
- To determine the stages for promoting and marketing an audiovisual product or service.
- To run advertising campaigns to promote audiovisual products in different media.

5.2.2. Structure and activities of the IACF program

The program was comprised by 15 activities that were divided into five modules; one module for each Design Thinking phase, as suggested by Stanford University's d.school (Empathy-Define-Ideate-Prototype-Test) (Doorley et al., 2018; Plattner, 2010).

- During the **Empathize** phase, students identified current global issues and concerns, as well as audiovisual trends. They formed teams (see activities 1 and 2 in Appendix 2) and were asked to identify themes to work on and prospective end users by creating an agents' map (see activity 3 in Appendix 2). The teams were then required to conduct an Empathy Interview (see activity 4 in Appendix 2). The goal was to collect as much information as they could by applying the following research techniques: observation, interview, safari, participative sessions, and smart-phone essays.

- During the next phase, **Define**, students explored the "problem space" in order to find design opportunities that would lead to them to frame a "solution fixation" (Leifer & Meinel, 2020:5). For this purpose, all team members had to agree upon a common perspective of the design problem by selecting the most valuable pieces of information. They were asked to visually display their insights on an empathy map (either with words or drawn) (see activity 5 in Appendix 2). The student teams then created personas (see activity 6 in Appendix 2) to better identify different user profiles and, after choosing their end user, they were asked to draw a user's journey (see activity 7 in Appendix 2). Finally, the teams defined the challenge by writing a "How might we…?" question that would constitute the core of the project (see activity 8 in Appendix 2).

- In the **Ideate** phase, participant teams were asked to generate a great number of ideas as potential alternatives for solving the design problem. Hence, several creativity-fostering activities were carried out; these activities were specifically designed to develop creative self-efficacy both at individual and team levels, and to encourage team co-creation. In these tasks, the teams were asked to perform different brainstorming sessions with the purpose of co-creating short stories based on the Basic Seven Plots (see activity 9 in Appendix 2), based on random objects (see activity 10 in Appendix 2), or based on random written concepts (see activity 11 in Appendix 2). After undergoing these small mastery experiences (Bandura, 1997a), student teams

had to come up an idea for an innovative audiovisual format or content and fill in the Ideation sheet (see activity 12 in Appendix 2).

- In the next phase, **Prototype**, the chosen idea was made tangible by building a low-resolution prototype. As an introduction to this task, the teams performed "the Marshmallow Challenge" and "Dark Horse" prototypes (see activities 13 and 14 in Appendix 2); then, they were introduced to different prototyping techniques, such as sketch, mock-up, role playing, storyboard and video ad/teaser prototyping techniques, and were asked to build their own prototype (see activity 15 in Appendix 2).

- Finally, the prototypes were tested with initial users in the **Test** phase. In this last step, team members prepared the testing (see activity 16 in Appendix 2), in order to observe how users interacted with the prototype, and capture their feedback in a feedback-capture grid (see activity 17 Appendix 2) in order to eventually refine the prototype. As a closing stage of the intervention program, student teams were asked to elaborate a final group report called "The IACF Logbook" (see activity 18 in Appendix 2), where they were expected to describe the final outcome (their innovative audiovisual format or content) as well as to reflect upon the process they had followed to accomplish it.

All the activities included in the IACF program are described in Table 6.

Table 6.

Activities and Goals of the "Innovative Audiovisual Contents and Formats" (IACF) Intervention Program

Activity name	Goals regarding Creative Self-efficacy	Design Thinking Phase
1. What am I good at?	- To identify student thinking preferences, strengths, and talents (*Personality*) to build an impactful team.	I. Empathy
2. Herrmann Brain Dominance Instrument (HBDI)		
3. Agents' Map	- To identify the panel of experts and practitioners within the problem space (*Field*).	
4. Empathy Interview	- To develop abilities for pre-production and role-division (*Personality*). - To gain skills for developing empathy with the user (*Personality*). - To gain knowledge on the user and their needs (*Domain* and *Field*).	
5. Empathy Map	- To develop abilities for analyzing, filtering, and organizing information (*Personality*). - To gain knowledge on the user and their needs (*Domain* and *Field*).	II. Define
6. Persona	- To gain knowledge on the user and their problems (*Domain* and *Field*). - To foster *Elaboration* skills through the characterization of the user, filling them up with details.	

Table 6. (continuation)

Activities and Goals of the "Innovative Audiovisual Contents and Formats" (IACF) Intervention Program

Activity name	Goals regarding Creative Self-efficacy	Design Thinking Phase
7. User's Journey Map	- To gain knowledge on the user and their problems through the identification of design opportunities (*Domain* and *Field*).	II. Define
8. How Might We…? (HMW question)	- To encourage both individual and team self-efficacy in ideational *Fluency*, by setting a starting point for the creation of a solution.	
9. Collaborative Story Creation	− To encourage both individual and team creativity by means of self-efficacy in ideational *Fluency*, *Flexibility*, and *Originality*, through co-creation and making connections between different concepts.	III. Ideate
10. The Playground		
11. The Three Bags		
12. Ideation Sheet	− To encourage both individual and team creativity by means of self-efficacy in ideational *Fluency*, *Flexibility*, and *Originality*, and specially, *Elaboration*. − To anticipate the human, technical and material needs and to divide the roles within the team according to each member's talents and expertise (*Field* and *Personality*).	III. Ideate
13. Marshmallow Challenge	− To encourage both individual and team creativity by means of self-efficacy in ideational *Fluency*, *Flexibility*, *Originality* and specially *Elaboration* through co-creation and hands-on experiences.	IV. Prototype

Table 6. (continuation)

Activities and Goals of the "Innovative Audiovisual Contents and Formats" (IACF) Intervention Program

Activity name	Goals regarding Creative Self-efficacy	Design Thinking Phase
14. Dark Horse	− To encourage both individual and team creativity by means of self-efficacy in ideational *Fluency*, *Flexibility*, and *Originality*, trying unusual approaches to problems. − To deepen the understanding on the user and their needs (*Domain* and *Field*) through the reaction to a "wild idea".	IV. Prototype
15. Prototyping Task	− To promote student self-efficacy in their *Elaboration* skills through the co-creation of a physical artifact.	
16. Testing the prototype	− To develop abilities for pre-production and role-division (*Personality*).	V. Test
17. Feedback Capture Grid	− To develop abilities for analyzing, filtering, and organizing information (*Personality*). − To deepen the understanding on the user and their needs (*Domain* and *Field*) through their reaction to the prototype.	
18. Final Report (Logbook)	− To encourage both individual and team creativity by means of self-efficacy in ideational *Fluency*, *Flexibility*, *Originality* and specially *Elaboration* through co-creation and hands-on experiences.	

The intervention program lasted 15 weeks and was worth 23 ECTS credits (575 hours). While 40 percent of the time (230 hours) was spent in class, on-site, the remaining 60 percent (345 hours) is out of class. During on-site classes there are lectures, various activities, and tutorials for student teams. It was expected that the program would improve the creative self-efficacy of Communication Studies undergraduates at Mondragon University, in order to better prepare them for the professional world (Gauntlett, 2015).

As part of the IACF program, during the 15-week period, students covered topics such as "Innovative Audiovisual Production" (6 ECTS credits), "Social Change and Challenges for the Future" (4 ECTS credits), "New Media Trends" (3 ECTS credits) "Social and cooperative entrepreneurship" (4 ECTS credits), and "Marketing and Distribution" (4 ECTS credits). Table 7 is a visual depiction of the IACF Program schedule.

As previously seen in point 3.2., facilitators play a key role in the Design Thinking process, because they guide and support students in problem-solving, teamwork, and creativity (Brookfield, 2016; Foster, 2016; Kochhar-Lindgren, 2016; Reisman, 2016). Moreover, facilitators have the responsibility of bolstering student creative self-efficacy by provided them with enough time (Elisondo, Donolo, & Rinaudo, 2009; Puente-Díaz & Cavazos-Arroyo, 2017a). Hence, in our program students were guided by two expert facilitators during their formal training in Design Thinking (2 ECTS credits), which included an introductory day, training in *Empathize*, training in *Define*, training in *Ideate*, training in *Prototype*, and training in *Test*. In addition to the two Design Thinking expert facilitators, another six facilitators took part at some point of the intervention program, representing a total of eight facilitators.

Table 7.

Visual Depiction of the Schedule of the IACF Program

<table>
<tr><th>Week</th><th colspan="2">Contents / Goals</th><th>Design Thinking Phase</th></tr>
<tr><td>1
Pre-test Phase</td><td rowspan="2">Fundamentals on Social Change and
Challenges for the Future</td><td rowspan="2">Fundamentals on New Media Trends</td><td rowspan="5">I.
Empathy</td></tr>
<tr><td>2</td></tr>
<tr><td>3</td><td colspan="2">Team Building, Topic selection and Design Thinking fundamentals</td></tr>
<tr><td>4</td><td colspan="2" rowspan="2">Exploration of the Problem Space</td></tr>
<tr><td>5</td></tr>
<tr><td>6</td><td colspan="2" rowspan="2">Identifying Opportunities and Defining the Challenge</td><td rowspan="2">II.
Define</td></tr>
<tr><td>7</td></tr>
<tr><td>8</td><td colspan="2" rowspan="2">Developing a New Audiovisual Concept
+ Fundamentals on Innovative Audiovisual Production</td><td rowspan="2">III.
Ideate</td></tr>
<tr><td>9</td></tr>
</table>

Table 7.

Visual Depiction of the Schedule of the IACF Program

<table>
<tr><th>Week</th><th colspan="3">Contents / Goals</th><th>Design Thinking Phase</th></tr>
<tr><td>10</td><td rowspan="2">Prototyping Innovative Contents / Formats</td><td rowspan="2">Social and cooperative entrepreneurship</td><td rowspan="2">Prototyping Innovative Contents / Formats</td><td rowspan="3">IV. Prototype</td></tr>
<tr><td>11</td></tr>
<tr><td>12</td><td>Prototyping Innovative Contents / Formats</td><td rowspan="2">Social and cooperative entrepreneurship</td><td>Prototyping Innovative Contents / Formats</td></tr>
<tr><td>13</td><td>Testing prototypes</td><td>Testing Prototypes</td><td rowspan="3">IV. Test</td></tr>
<tr><td>14</td><td colspan="3">Refining prototypes + Fundamentals on Marketing and Distribution</td></tr>
<tr><td>15 Post-test Phase</td><td colspan="3">Presentation and Evaluation Week</td></tr>
</table>

5.3. Method

5.3.1. Participants

The original sample consisted of 108 subjects, but 15 participants dropped out, as they failed to provide either their pre-test or post-test measures, giving a final total of 93 subjects (53.8% female and 46.2% male) whose ages ranged between 19 and 25 years old (Mage = 21; SD = 1.137). All participants were undergraduate students of a Bachelor's Degree in Communication Studies at two universities located in the Basque Autonomous Community (northern Spain). Specifically, 53 subjects in their 3rd and 4th year constituted the control group and 40 undergraduates in their 4th year participated in the Design Thinking-based university program, thereby constituting the experimental group. Participants were divided into 13 teams according to their personal interests and profiles: two teams of two people, two teams of three people, three teams of four people, three teams of five people and two teams of six people (n = 49). Full details of the characteristics of the research sample are depicted in Table 8.

Table 8.

Characteristics of the Research Sample according to Group Condition, Institution, Academic Year, and Gender

	Experimental Group	*Control Group*		*Gender*	
	4th year	3rd year	4th year	Male	Female
Mondragon University (MU)	40	24	-	32	32
Public University of the Basque Country (UPV/EHU)	-	-	29	11	18
Subtotal	40	53		43	50
Total (N=93)					

5.3.2. Research Design

The research design of the present study is quasi-experimental with a non-equivalent control group (Campbell & Stanley, 1995; Salkind, 2010), which has been used in past research into creative self-efficacy with similar sample sizes (Mathisen & Bronnick, 2009). The design and schedule of the program did not allow us to randomly select the participants in the experimental group. Moreover, the small number of students in the 4th year of their Communication Studies degree made it impossible to split the group in halves in order to designate one half as the experimental group and the other half as the control group. Hence, subjects in the control group did not share exactly the same characteristics as those in the experimental group. Nonetheless, there were enough similarities between the two groups (age, academic discipline, territoriality) to fulfill the criteria of a rigorous research design that controls the main effects of history, maturation effect, test administration and measurement (Campbell & Stanley, 1995).

5.3.3. Instruments

To evaluate the program's effect on the variables studied, the following instruments were administered before and after the program: the Creative Self-Efficacy Inventory-Spanish (CSEI-S); Tierney & Farmer's CSE Scale (2002); A reduced Spanish version of the Need for Cognition Scale (NC) (Falces et al., 2001), Team Satisfaction (Santos, Uitdewilligen, & Passos, 2015) and the IACF Program Satisfaction Questionnaire.

- The CSEI-S is a 26-item self-report inventory comprised of seven dimensions that measures the subject's self-beliefs regarding his or her ability to perform creatively in terms of Fluency (e.g. *"Pienso en muchas respuestas ante un problema"* / "I come up with many answers to a problem"); Flexibility (e.g. *"Ante los problemas respondo de maneras o estilos diferentes"* / "When faced with problems, I respond in different ways or styles"); Elaboration (e.g. *"Asocio mis nuevas ideas o sueños a cosas que ya he aprendido"* / "I connect new ideas or dreams to things I have already learned"); Originality (e.g. *"Encuentro una solución novedosa antes que otras personas"* / "I find a novel solution before

other people do"); Domain (e.g. *"Empiezo a aprender algo, incluso habiendo obstáculos para hacerlo"* / "I start to learn something, even when there are obstacles to doing so"); Field (e.g. *"Trabajo con otras personas para convencerlas de que lo que hago es lo mejor"* / "I work on other people to convince them that what I do is the best"); and Personality (e.g. *"Me divierto creando nuevas ideas tras haber aprendido de otras personas"* / "I have fun creating new ideas after learning from other people"). Items are responded to on a 6-point Likert scale, with options ranging from 1 (Strongly disagree) to 6 (Strongly agree). In the present study, the inventory showed adequate psychometric properties with suitable internal consistency and temporal stability indexes for all 7 dimensions, in which Cronbach's alpha values were .83 for *Fluency*, .84 for *Flexibility*, .73 for *Elaboration*, .89 for *Originality*, .69 for *Domain*, .81 for *Field*, and .85 for *Personality*.

- Creative-Self-Efficacy Scale (CSE Scale; Tierney & Farmer, 2002). To assess the subject's general belief regarding his or her ability to perform creatively, we used the three-item scale developed by Tierney and Farmer, which uses a 6-point Likert scale of 1 (Strongly disagree) to 6 (Strongly agree). A sample item is "Siento que soy bueno/a generando nuevas ideas" / I feel that I am good at generating novel ideas." This short scale has shown appropriate psychometric properties, with a Cronbach's alpha value of .76.

- A reduced Spanish version of the Need for Cognition Scale (NC; Falces et al., 2001). The reduced Spanish NC measures the extent to which individuals are motivated to think. It is comprised of a positive factor related to the tendency to make mental effort (Preference for cognition, e.g. *"Me atraen más los problemas muy complejos que los sencillos"* / "I am more attracted by highly complex problems than by simple ones"), and a negative factor related to the tendency to avoid and reject situations requiring sustained mental effort (Avoidance of cognition, e.g. *"Prefiero pensar el mínimo necesario en cada caso"* / "I prefer to think as little as possible in each case"). The NC has 18 items (9 items per subscale) with response options ranging from 1 (Totally disagree) to 5 (Totally

agree). The NC has shown adequate psychometric properties in its original version with Cronbach's alpha values of .83 (Preference for Cognition) and .74 (Avoidance of Cognition). In the present study, the Preference and Avoidance dimensions showed adequate internal consistency with Cronbach's alpha values of .85 and .71, respectively.

- Team Satisfaction Scale (adapted from Spector, 1997). The team satisfaction of the experimental group (n=40) was measured using eight items adapted by Santos, Uitdewilligen and Passos (2015). The scale showed satisfactory internal consistency, with a Cronbach's Alpha value of .90 for the present study. Team Satisfaction was measured at the end of the intervention program (week 15).

- IACF Program Satisfaction Questionnaire. An ad-hoc questionnaire comprising 38 close-ended and open-ended questions was designed to measure student satisfaction with the three major aspects of the intervention program: (a) student participation, (b) the facilitators, and (c) the characteristics of the intervention program. Thus, student satisfaction with regard to their participation was measured with three items (two close-ended questions and one open-ended question); satisfaction with the facilitators was measured with 25 items (three items per facilitator plus one open-ended question in the end); satisfaction towards the characteristics of the intervention program was measured in terms of materials (one item), contents (one item), the Design Thinking process (one item), evaluation (one item), organization (one item) and learning goals (one item), in addition to two open-ended questions. Finally, students were asked to rate their overall satisfaction with one last item. Close-ended items where answered using a 1-10 Likert scale.

5.3.4. Procedure

An email was sent to both universities explaining the research project and asking for permission to administer the above-mentioned battery of assessment measures to both the experimental and control groups. After obtaining informed consent from the participating educational centers, one member of the research team conducted the pre-

test measure by administering the assessment battery to both groups. Data were collected during the students' regular timetable and in their usual classrooms. The experimental group then underwent the Design Thinking-based intervention program during a 15-week period. Table 9 shows the distribution of the activities of the IACF program throughout the 15 weeks.

Table 9.

Distribution of the IACF Activities throughout the 15-week Program

Design Thinking Phase		**I. Empathize**					**II. Define**		**III. Ideate**		**IV. Prototype**			**V. Test**		
Week		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Activity Number	**1**															
	2															
	3															
	4															
	5															
	6															
	7															
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	9															
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	11															
	12															
	13															
	14															
	15															
	16															
	17															
	18															

At the end of the program the same assessment battery was administered again to both groups (experimental and control) in order to compare and evaluate the impact of the program on the study variables. In addition, the previously mentioned ad-hoc satisfaction questionnaire was added to the assessment battery of the experimental group in order to evaluate overall fulfillment with regard to the intervention program. The study met the ethical values required in research with human beings (informed consent, the right to information, protection of personal data, guarantee of confidentiality, no discrimination, gratuity, and the possibility of dropping out of the study at any phase).

5.3.5. Data analysis

The data were analyzed using IBM SPSS software (version 22). With the aim of examining the program's impact on the variables studied, comparisons between the experimental group's first scores (pre-test) and the scores obtained after implementation of the program (post-test) were performed using the Student's *t*-statistic for related samples. In turn, the effect sizes associated with each comparison of means were calculated using Cohen's *d* statistic. The same analysis was performed to compare the results obtained in the experimental and control groups, and when comparing the effects of the program in males and females.

5.4. Results

5.4.1. Differences in the pre-test and post-test scores of the experimental group regarding Tierney and Farmer's CSE, CSEI-S dimensions, and Need for Cognition (NC)

The mean scores and standard deviations obtained for the experimental group (n=40) are presented in Table 10, specifically those obtained for ten variables (Tierney and Farmer's Creative Self-Efficacy, Fluency, Flexibility, Elaboration, Originality, Domain, Field, Personality, Preference for Cognition, and Avoidance of Cognition) before and after the program. The Student's *t* and Cohen's *d* values for the comparison between pre-test and post-test are also shown.

Table 10.

Mean Scores, Standard Deviations, and Student's t and Cohen's d Values Obtained during the Pre-test and Post-test Phases for the Experimental Group Participants

	Pre-test		Post-test		ANOVA Pre-post		
	M	*SD*	*M*	*SD*	*p*	*t*	*d*
Tierney and Farmer's Creative Self-Efficacy	12.45	2.72	13.7	2.43	.001**	3.27	0.48
Fluency	16	3.66	17.05	3.39	.04	2.12	0.29
Flexibility	15.67	3.05	16.42	3.08	.093	1.72	0.24
Elaboration	12.65	2.81	12.82	1.98	.58	.55	0.06
Originality	13.25	4.14	15.55	3.97	.001**	.56	0.56
Domain	13.03	2.55	12.77	2.22	.51	.66	0.10
Field	14.03	3.72	15.77	3.32	.001**	.35	0.49
Personality	17.28	3.83	17.47	3.34	.67	.42	0.05
Preference for Cognition	29.5	6.06	26.75	3.52	.01*	2.48	0.55
Avoidance of Cognition	29.63	6.54	34.9	4.96	.001**	4.23	0.90

**p < .001; *p < .01

As can be seen in Table 10, the program for promoting student creative self-efficacy in Communication Studies via the Design Thinking process improved the students' scores particularly in Avoidance of cognition (NC; Cohen's d = 0.90), with an effect size of notable magnitude. Moreover, creative self-efficacy levels measured using Tierney and Farmer's CSE scale (2002) also improved significantly following the program, together with two other variables in the CSEI-S (Originality and Field), with effect sizes of a medium-high magnitude: 0.48, 0.56 and 0.49, respectively. Given that these results are statistically significant, it should be noted that the program influenced Preference for Cognition, as measured by the NC, with an effect size of medium-high magnitude (Cohen's d = 0.55). Finally, though with a lower level of statistical significance, students from the experimental group improved their Fluency levels in the post-test, with a low-magnitude effect size (Cohen's d = 0.29).

5.4.2. Differences between the experimental group and control group regarding Tierney and Farmer's CSE, CSEI-S dimensions, and Need for Cognition (NC)

Table 11 presents the mean scores and standard deviations obtained by experimental and control group participants in all the variables measured before (pre-test phase) and after (post-test phase) the program's implementation, in addition to the F values obtained in the analysis of covariance and Cohen´s d for the comparison between groups.

Table 11.

Mean Scores, Standard Deviations, and Results of the Analysis of Covariance of the Experimental and Control Groups in Pre-test and Post-test Phases

	Experimental group (*n* = 40)				**Control group (*n* = 53)**				**Experimental – Control (n = 93)**							
	Pre-test		**Post-test**		**Pre-test**		**Post-test**		**Anova Pre-test**				**Anova Post-test**			
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*F*	*p*	*t*	*d*	*F*	*p*	*t*	*d*
Creative self-efficacy	12.45	2.72	13.7	2.43	12.72	1.93	13.06	1.92	4.62	.60	.55	0.11	1.76	.17	1.42	0.29
Fluency	16	3.66	17.05	3.39	16.3	2.85	16.26	2.64	2.9	.66	.44	0.09	2.57	.23	1.25	0.26
Flexibility	15.67	3.05	16.42	3.08	15.88	2.47	15.86	2.34	2.22	.72	.36	0.24	2.15	.34	.98	0.20
Elaboration	12.65	2.81	12.82	1.98	12.17	2.59	11.86	2.08	.04	.40	.85	0.17	.24	.02*	.23	0.47
Originality	13.25	4.14	15.55	3.97	13.21	3.44	14.58	2.92	1.82	.95	.05	0.01	3.33	.20	1.35	0.28
Domain	13.03	2.55	12.77	2.22	13.11	2.33	12.35	1.77	.56	.86	.17	0.03	.40	.33	1	0.21
Field	14.03	3.72	15.77	3.32	14.19	3.34	15.47	2.59	.017	.82	.22	0.04	2.42	.63	.49	0.10
Personality	17.28	3.83	17.47	3.34	17.72	3.74	16.41	2.73	.15	.57	.55	0.11	1.52	.10	1.68	0.35
Preference for Cognition	29.5	6.06	26.75	3.52	29.96	6.55	27.15	4.22	.11	.72	.34	0.07	.75	.62	.48	0.10
Avoidance of Cognition	29.63	6.54	34.9	4.96	31.66	6.22	34.55	4.37	1.58	.13	1.52	0.31	.04	.72	.36	0.07

**p < .01; *p < .05

The analysis of covariance revealed that the experimental group's scores were higher in the post-test phase than those of the control group, and this difference was statistically significant in the Elaboration dimension when measured by the CSEI-S. The magnitude of both differences was medium (Cohen's $d = 0.47$). The program was found to have a lower impact on the Personality dimension when measured by the CSEI-S, having a medium effect size (Cohen's $d = 0.35$).

5.4.3. Differences in Creative Self-Efficacy across Genders

To assess whether the program had different effects as a function of gender - that is, to analyze whether the program stimulated a higher level of change in males or in females, or whether both genders increased their scores equally - we carried out a pre-test-post-test multivariate analysis of variance (MANOVA). The results revealed that the change stimulated by the intervention based on Design Thinking methodology was similar in both genders.

In fact, there were no statistically significant differences between males and females in the experimental group with respect to any of the indicators, and nor were there any statistically significant differences in the changes they experienced as an effect of the program (see Table 12). Therefore, we can deduce that the intervention did not have a differential impact as a function of gender.

Additionally, the pre-test measures of both experimental and control groups were compared by means of a T test to examine the appropriateness of the non-equivalent control group. The analysis revealed no statistically meaningful differences regarding the initial creative self-efficacy levels in any of its seven dimensions between participants in the experimental group and those in the control group, confirming the adequacy of the control group used in the present study.

Table 12.

Mean Scores, Standard Deviations, and Student's t, F and Cohen's d values for Males and Females Obtained during the Pre-test and Post-test Phases

	Females (*n* = 21)				**Males (*n* = 19)**				**ANOVA pre-test Females - Males**			**ANOVA post-test Females - Males**		
	Pre-test		*Post-test*		*Pre-test*		*Post-test*		*F*	*p*	*t*	*F*	*p*	*t*
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*						
Tierney and Farmer's Creative Self-Efficacy	12.29	2.72	13.71	2.34	12.63	2.79	13.68	2.58	*.061*	*.69*	*.39*	.105	.96	.03
Fluency	16.52	3.73	17.14	3.22	15.42	3.59	16.94	3.65	.005	.34	.94	.047	.85	.18
Flexibility	15.71	3.01	16.38	2.74	15.63	3.18	16.47	3.5	.155	.93	.69	.702	.92	.09
Elaboration	12.52	.57	12.8	1.99	12.79	3.08	12.84	2.03	.783	.77	.38	.084	.95	.05
Originality	13.1	4.04	15.09	4.39	13.42	4.37	16.05	3.5	.041	.80	.84	1.48	.45	.75
Domain	12.9	2.64	12.61	2.1	13.16	2.52	12.94	2.39	.093	.75	.76	.134	.64	.46
Field	13.48	3.17	15.52	3.4	14.63	4.25	16.05	3.3	1.23	.33	.27	.065	.62	.49
Personality	17	3.4	17.23	2.94	17.58	4.32	17.73	3.79	1.14	.63	.29	.259	.64	.46
Preference for Cognition	29.14	5.32	26.86	3.94	29.89	6.91	26.63	3.09	.82	.70	.37	2.11	.84	.20
Avoidance of Cognition	29.29	7.22	34.86	5.97	30	5.86	34.95	3.68	2.08	.73	.15	2.44	.95	.05

5.4.4. Correlations between the dimensions of the CSEI-S and Team Satisfaction.

Team Satisfaction was measured with the eight-item scale adapted by Santos, Uitdewilligen and Passos (2015). The results (see Table 13) showed, on the one hand, a moderate correlation with Fluency, Flexibility, and Personality (r = .55, .54, and .48 respectively; $p < .01$), and on the other hand, a low-moderate correlation with Elaboration and Field (r = .33, and .37 respectively; $p < .05$).

Table 13.

Pearson Correlations between the dimensions of the CSEI-S and Team Satisfaction of Participants in the Experimental Group

	1	2	3	4	5	6	7	8
1. CSEI-S Fluency	-							
2. CSEI-S Flexibility	.744**	-						
3. CSEI-S Elaboration	.610**	.581**	-					
4. CSEI-S Originality	.737**	.534**	.682**	-				
5. CSEI-S Domain	.578**	.589**	.542**	.652**	-			
6. CSEI-S Field	.666**	.419**	.522**	.652**	.600**	-		
7. CSEI-S Personality	.727**	.551**	.662**	.682**	.704**	.716**	-	
8. Team Satisfaction	.548**	.540**	.329**	.218	.292	.337*	.477**	-

** Significant at 0.01 level (2-tailed).

* Significant at 0.05 level (2-tailed).

5.4.5. Student Satisfaction with the IACF intervention program

Students who participated in the 'Innovative Audiovisual Contents and Formats' program were asked to fill in an ad-hoc satisfaction questionnaire after they had completed the 15-week curriculum, with the purpose of evaluating their overall fulfillment with regard to the intervention program. Students were asked to rate their satisfaction in relation to the three major aspects of the program: (1) student participation, (2) the facilitators, and (3) the characteristics of the intervention program. Of an initial sample of 49 students who undertook the IACF program, a total of 35 completed the satisfaction questionnaire.

When asked about student teams' commitment, responsibility and the work carried out during the 15-week experience, they rated their own participation throughout the intervention program with high scores, with 8.06 representing the average value (1-10 Likert scale).

A total of 8 different facilitators took part in the IACF intervention program, and students showed mixed opinions depending on the facilitator being evaluated; scores were low-moderate, ranking from 5.09 to 7.17. Open-ended questions revealed a generalized perception of a lack of communication amongst the facilitators. Furthermore, some students found the contributions made by certain facilitators to be irrelevant and asked for greater involvement from them. Figure 5 provides detailed information regarding the scores assigned by students to each of the facilitators.

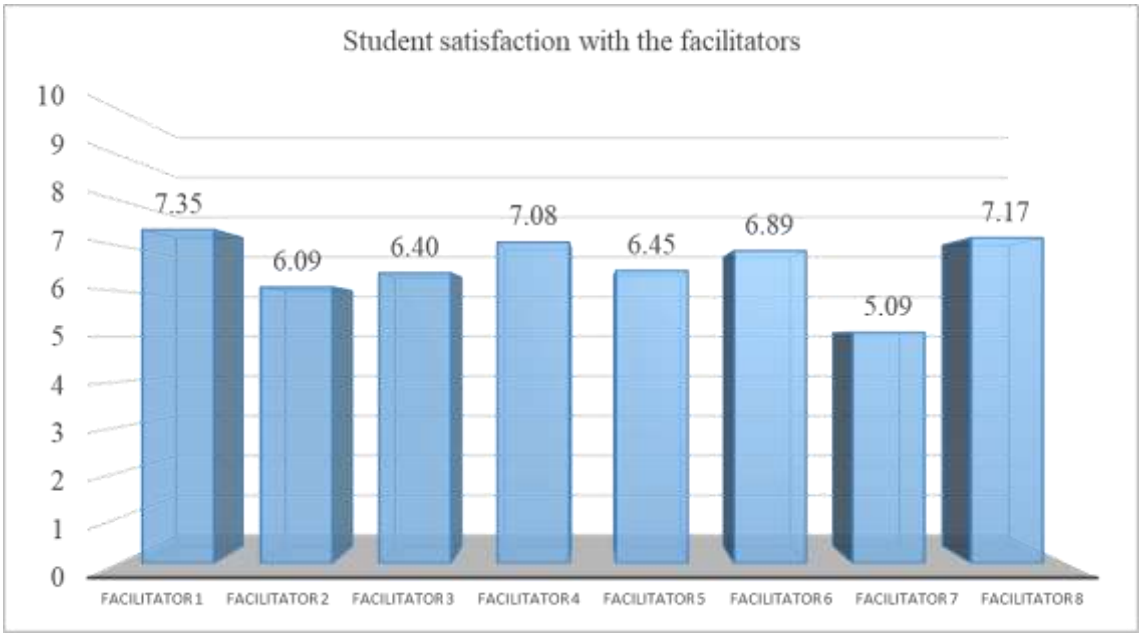

Figure 5. Scores Provided by Students from the Experimental Group Regarding their Satisfaction with the Facilitators in the IACF Program.

With regard to the characteristics of the IACF program, students were required to rate their satisfaction level in terms of the following aspects: Materials Provided, Course Contents, the Design Thinking Process, the Evaluation System, Learning Outcomes and Organization of the intervention program. Their overall satisfaction level regarding the aforementioned aspects was moderate. The least appreciated aspect was the organization of the program. In this sense, the open-ended questions revealed that many students perceived the length of the program to be excessive. Moreover, they claimed that the workload was unbalanced over the 15 weeks, with weeks that were either “too busy” or “free”. Some student teams acknowledged having difficulties in organizing their daily work, claiming there were “too many off-site days”.

When asked about the positive and negative aspects of the intervention program, students generally appreciated the freedom and autonomy they were given for designing and developing a tailored project according to their interests. In contrast, they mostly regarded the program as “too long” and urged for better organization of the contents and the day-to-day schedule.

Whilst the Design Thinking process was the second least popular characteristic of the intervention program, the comments made in the open-ended questions show that students perceived Design Thinking as a helpful process for carrying out their projects. Indeed, one student specifically expressed the desire for adding more Design Thinking training sessions. More detailed information is provided regarding the scores of the IACF program's characteristics in Figure 6.

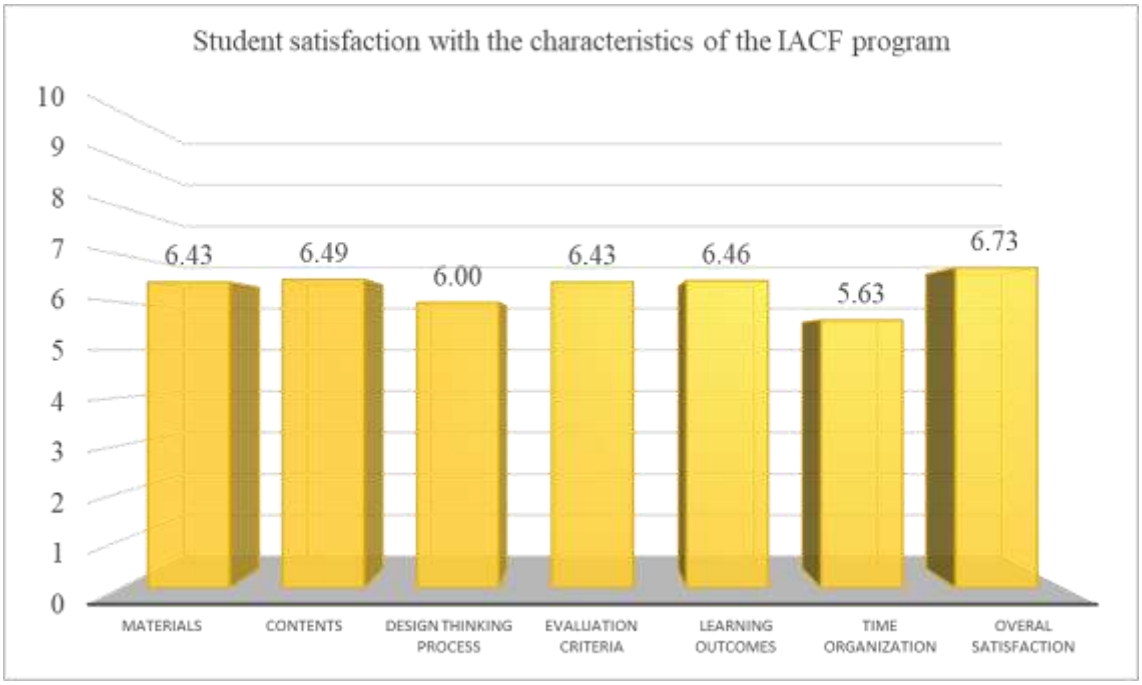

Figure 6. Scores Provided by Students from the Experimental Group Regarding their Satisfaction with the Characteristics of the IACF Program.

Finally, when asked about the positive and negative aspects of the intervention program, students generally appreciated the freedom and autonomy they were given for designing and developing a tailored project according to their interests. On the other hand, they mostly regarded the program as "too long" and asked for a better organization of the contents and the day-to-day schedule. In the end, the overall satisfaction of students with the IACF program was rated with an average of 6.73.

Summary and Conclusions of the Fifth Chapter

Creativity is regarded as an essential skill for professionals, and it is a challenge for Higher Education centers to develop programs to help students develop this attribute. Through the development of self-beliefs in their creative abilities, students become more willing to accept creative challenges and *think outside the box*. Because Design Thinking is considered to be beneficial for the development of student creative self-efficacy, the number of universities embracing it in their curricula is increasing. However, despite the variety of emerging educational programs that employ Design Thinking to train or/and promote student creativity or creative self-efficacy, to the best of our knowledge, none has yet been specifically designed and applied to the academic domain of Communication Studies.

In the present chapter, we describe the designing, implementation and evaluation of a Design Thinking-based university program called "Innovative Audiovisual Contents and Formats" (IACF). The aim of the intervention program was to help Communication Studies undergraduates develop their creative self-efficacy by immersing them in the Design Thinking process while they created innovative audiovisual content or formats. After comparing pre-test and post-test measures from Tierney and Farmer's one-dimensional CSE Scale (2002), it can be concluded that the creative self-efficacy levels of the participants were significantly enhanced. When creative self-efficacy was analyzed as a seven-dimensional construct only some aspects of the perceived judgments with regard to students' creative abilities were found to have improved after the 15-week intervention program. Specifically, participants from the experimental group increased their Originality and Field scores in a statistically meaningful way, while Fluency was valued at a more moderate level. These results are in line with those obtained by Hass, Katz-Buonincontro, and Reiter-Palmon (2016), Intasao and Hao (2018), Karwowski (2011) and Puente-Díaz and Cavazos-Arroyo (2017a). According to these researchers, participants who underwent a Design Thinking-based program strengthened their beliefs in their ability to generate a great number of ideas, to generate genuine ideas (Guilford, 1967), and to successfully identify, connect and work with experts within a specific domain (Csikszentmihalyi, 1999; Plattner, 2012). This increase was the same regardless

of gender, which is also consistent with other previous studies (Beghetto, Kaufman, & Baxter, 2011; Haase et al., 2018; Kerr, 2009).

An unexpected statistically significant difference was found regarding the Elaboration dimension when the post-test measures of the experimental and control groups were compared. However, while the former outscored the latter in general, the Elaboration scores of participants in the experimental group did not significantly improve after the intervention program. We hypothesize that the requirement for students in the experimental group to make their idea tangible during the Prototype phase might have resulted in this difference, as rapid prototyping has been found to benefit student creative self-efficacy in the past (Dow et al., 2012). We therefore suspect that the fourth stage of the Design Thinking process indirectly influenced student Elaboration beliefs.

In addition to a boost in creative self-efficacy, the Preference for Cognition of the participants in our experimental group was enhanced after completing the intervention program, supporting the finding of previous studies that positively associated creativity-related constructs with NC (Butler, Scherer, & Reiter-Palmon, 2003; El-Haq, Abdelaziz, & Mohamed, 2016; He et al., 2019; Jafari & Zarghami, 2017; Watts, Steele, & Song, 2017) Nonetheless, the dimension that most improved among students in the experimental group was Avoidance of Cognition, perhaps due to a maturation effect (Campbell & Stanley, 1995), since participants in the control group also improved their Avoidance of Cognition in a statistically significant way, despite not having undergone the intervention program. In order to explore these inconsistencies, Avoidance of Cognition needs to be the focus of further research.

Our qualitative results show that there is room for improvement within the IACF program. On the one hand, the data reveal that students were most dissatisfied with the way the program was organized in terms of schedule. They experienced difficulties in handling the freedom and autonomy allowed by the intervention program. Hence, in the future, care should be taken to achieve a better balance in the intervention program's workload over the 15 weeks, to avoid students finding themselves "too busy" or "too free". Students should be encouraged to work in similar conditions from the first year of

their degree in order to gradually increase their autonomy year by year. Currently, most assignments during the bachelor's degree are product-oriented and lineal, in contrast to the exploratory and iterative nature of the Design Thinking process. Providing students with enough time for thinking and reflecting while balancing the workload seems crucial, in order to prevent time constraints from acting as an inhibitor of CSE (Dolšak & Hillyard, 2016; Ohly, Plückthun, & Kissel, 2017; Reisman, 2016).

On the other hand, another aspect that could be improved is the program facilitators, as a potential key force in the promotion of student creative self-efficacy (Brookfield, 2016; Elisondo, Donolo, & Rinaudo, 2009; Foster, 2016; Kochhar-Lindgren, 2016; Puente-Díaz & Cavazos-Arroyo, 2017a; Reisman, 2016). Our students' responses suggest that, in the future, facilitators should work as a team by improving the communication amongst them and trying to make more meaningful contributions. In should be pointed out that only two facilitators were, in fact, Design Thinking experts; therefore, further training in Design Thinking is recommended in order to reduce differences in expertise.

Finally, whilst student satisfaction with the Design Thinking process was moderate, they generally regarded it as useful. In light of this evaluation, training students in Design Thinking from the onset of their undergraduate degree would help familiarize them with the process from an early stage and enable and encourage them to use it throughout their academic career.

Limitations of the Study and Future Research

As in all research, the work reported in this chapter has its limitations. On the one hand, the reduced number of students enrolled in a Bachelor of Communication Studies degree hinders and considerably narrows the sampling procedure. Our participants could not be randomly selected for any of the sample groups, resulting in a quasi-experimental research design with a non-equivalent control group. Nevertheless, this design is consistent with previous research examining creative self-efficacy, which has also followed a quasi-experimental research design with similar sample sizes (Mathisen & Bronnick, 2009).

In addition to the limited size of the sample, all participants were recruited from a limited geographical area (the Basque Autonomous Community), rendering it difficult to make generalizations about the results or to draw conclusions regarding other contexts. Naturally, a larger and more geographically diverse sample would be desirable in order to increase the consistency of the results. However, the present study was not intended to establish a general cause-and-effect relationship between Design Thinking and creative self-efficacy but, rather, to describe and evaluate the implementation of the IACF program by assessing changes observed in the creative self-efficacy levels of Communication Studies undergraduates.

Basing data-gathering using self-report instruments can result in a mono-method bias. Hence, in order to better understand how a Design Thinking-based program influences, not only students' creative self-efficacy (Person), but also creativity in all its complexity (Person, Process, Product and Context), future research concerning the IACF program should include additional measures within its evaluation system. For instance, the Torrance Test of Creative Thinking (Oliveira et al., 2009; Torrance, 1974) could reliably measure divergent thinking abilities (Process), and the Consensual Assessment Technique (CAT) (Amabile, 1982) could be employed to assess the creativity of the outcome (Product) by student teams.

Furthermore, following the principles of the Design Thinking process, students carried out their projects in teams, while creative self-efficacy was measured only at the individual level. In this sense, we measured participants' satisfaction with their teams, and found that team satisfaction was positively correlated to five of the seven dimensions of creative self-efficacy. Exploring the influence of team settings in individual creative self-efficacy may offer valuable information, as previous studies suggest that problems within teams may undermine an individual's efficacy beliefs in their creative abilities (Ohly, Plückthun, & Kissel, 2017).

Likewise, it would be interesting to develop an instrument aimed at measuring the creative efficacy of groups (influence of Context), as proposed by Puente-Díaz (2016). To date, the most similar assessment tool found within the literature is the team creative

confidence measure, by Baer and colleagues (2008). This three-item one-dimensional scale measures the shared belief that collective structures (such as teams) generate creative ideas more effectively. However, as yet, no multidimensional assessment tool has been developed to measure creative self-efficacy at team level. By reaching a deeper understanding of the relationship between CSE beliefs on both individual and group levels, teams would benefit more effectively from individual contributions and thus increase group creative efficacy.

In summary, the results obtained in this study suggest that the IACF program is to some extent beneficial in helping Communication Studies undergraduates to strengthen perceptions of their ability to perform creative tasks. The findings obtained during the first edition of the IACF program are sure to be of use in refining it to help students develop all seven dimensions of creative self-efficacy.

Final Considerations

The last part of this dissertation centers on providing some general theoretical, methodological, and empirical considerations, as the conclusions of each part of our research have been presented individually at the end of each chapter. Likewise, we will discuss the theoretical, methodological, and empirical limitations encountered throughout the development of this thesis. Finally, we will explore how future investigations could address these limitations and serve as a basis for establishing interesting new lines of research.

Main Theoretical, Methodological, and Empirical Contributions

Theoretical Contributions

With this dissertation, we have set out to improve understanding of creativity and creative self-efficacy by exploring the Design Thinking process in Higher Education. We have conceptualized creative self-efficacy as a construct comprised of seven dimensions or self-efficacies: self-efficacy in Fluency, Flexibility, Elaboration, Originality, Domain, Field and Personality. As part of this conceptualization, we have integrated aspects of divergent thinking, commonly referred to as *creative thinking* (Guilford, 1967; Torrance, 1974) and *creative performance* (Csikszentmihalyi, 1999), based on the theoretical model for creative self-efficacy developed by Abbott (2010). These theoretical (thinking) and practical (performance) aspects of creative self-efficacy are consistently reflected in the literature, as evidenced by previous research conducted mainly in Asian territories (Hill, Tan, & Kikuchi, 2008; Hung, 2018; Tan et al., 2008; Tan, Li, & Rotgans, 2011; Tan & Tan, 2015).

In addition, we have reviewed and summarized the most relevant sources of information with regard to Design Thinking in order to provide a solid conceptualization. This has led us to refer to Design Thinking as a human-centric process aimed at creating innovative solutions to wicked problems by applying the cognitive mechanisms followed by product design engineers. We have provided the reader with an overview of the origins of the Design Thinking process, its main stages and principles, and its educational application. Finally, this dissertation unifies Design Thinking theory and Bandura's (1997b) Social Cognitive Theory, providing evidence of how each phase of Design

Thinking is directly associated to the four sources of self-efficacy (enactive mastery experiences, vicarious experiences, verbal persuasion and affective states) (Jobst et al., 2012). The conceptualization of the Design Thinking process applied to educational contexts, in addition to its link to self-efficacy, has served as the basis for designing and implementing a new intervention program to develop the creative self-efficacy of Communication Studies undergraduates.

Methodological Contributions

The assessment of Creativity has been subject to controversy for decades. In an attempt to objectify and systematize this discipline, research has traditionally relied on divergent thinking batteries in order to measure individual creative potential. Nonetheless, a newer body of literature has aroused interest in exploring self-beliefs of creativity, thereby switching the focus away from evaluating the cognitive abilities underlying the creative process and overcoming objectivity. Until now, creative self-efficacy assessment has been measured mostly with short one-dimensional scales (Beghetto, 2006; Carmeli & Schaubroeck, 2007; Choi, 2004; Karwowski, 2011; Karwowski et al., 2013; Tierney & Farmer, 2002), following the original conception of its one-dimensional nature (Tierney & Farmer, 2002). Whilst different multidimensional instruments for assessing perceived beliefs of one's creative abilities have been developed in recent years (Abbott, 2010; Hill, Tan, & Kikuchi, 2008; Hung, 2018; Tan, Ho, & Yong, 2007; Tan et al., 2008; Tan, Li, & Rotgans, 2011; Tan & Tan, 2015; Yang, 2007), this continues to be an emerging area of research. In this context, the adaptation and validation of the Creative Self-Efficacy Inventory-Spanish (CSEI-S) constitutes the main methodological contribution of this dissertation.

The CSEI-S can be distinguished from other available multidimensional instruments to assess students' perceptions about their creative abilities in two major aspects. On the one hand, at the time of publication of this dissertation there is no multidimensional creative self-efficacy scale available in the Spanish language. By adapting Abbott's (2010) Creative Self-Efficacy Inventory into Spanish and validating it, we aim to make accessible an instrument with which to reliably assess student creative

self-efficacy in Spanish-speaking Higher Educational contexts. On the other hand, the CSEI-S integrates the four elements of divergent or creative thinking (Fluency, Flexibility, Elaboration and Originality), as well as components of creative performance (Domain, Field and Personality). With seven dimensions, the CSEI-S is currently the most extensive multidimensional instrument amongst its competitors and can be used to assess the effectiveness of intervention programs in Higher Education aimed at developing student creative self-efficacy.

Empirical Contributions

The "Innovative Audiovisual Contents and Formats" intervention program (IACF program) has been implemented and evaluated during the development of this dissertation with a major objective in mind. It was conceived to help students promote their creative self-efficacy, to positively influence students' academic performance and college success, and to impact on their creative performance. Traditionally, educational programs designed to promote student creativity mostly aim to impact on the cognitive abilities involved in divergent or creative thinking. In recent years, there has been a switch of focus from cognition to the creative *self* manifested in a growing body of studies evaluating intervention programs designed and implemented to enhance undergraduate creative self-efficacy in a variety of educational stages and academic domains (Brockhus et al., 2014; Denson & Buelin-Biesecker, 2015; Mathisen & Bronnick, 2009; Ohly, Plückthun, & Kissel, 2017). Nonetheless, to date, the academic domain of Communication Studies in Higher Education has been neglected. Thus, the IACF program was specifically designed to promote the self-beliefs of Communication Studies undergraduates' in their creative abilities.

To achieve this objective, the IACF intervention program was structured according to the five stages of the Design Thinking process. Since the sources of self-efficacy are fundamental for building creative self-efficacy (Puente-Díaz, 2016), the Design Thinking process has the potential for providing students with the mastery experiences, vicarious experiences, social persuasion and affective states to help them promote their creative efficacy beliefs (Jobst et al., 2012). Additionally, we introduced

specifically designed course contents relevant for the development of effective innovative audiovisual formats and contents. In this way, while Communication students work on their projects, they gain expertise in Design Thinking, eventually reaching a meta-cognitive level that enables them strengthen their creative self-efficacy (Wrigley, Mosely, & Tomitsch, 2018; Wrigley & Straker, 2017).

Limitations of the Study and Future Research

Theoretical Limitations and Future Research

The current conceptualization of creative self-efficacy regards it as both a malleable and highly specific construct subject to variations depending on the domain and task requirements (Beghetto & Karwowski, 2017; Karwowski, Han, & Beghetto, 2019; Karwowski, Lebuda, & Beghetto, 2019; Tierney & Farmer, 2011). However, the characteristics of the sample recruited for the adaptation and validation of the Creative Self-Efficacy-Spanish (CSEI-S) described in **Chapter four** did not allow us to examine potential differences regarding students' creativity self-beliefs across academic domains. Expanding the administration of the CSEI-S to STEM could help overcome the theoretical limitations of the dissertation in future studies.

Methodological Limitations and Future Research

We acknowledge some methodological limitations in the present work. First, the sample used for adapting and validating the CSEI-S was drawn from a very limited geographical area (the Basque Autonomous Community). A larger and more geographically diverse sample could benefit the application and standardization of the CSEI-S in other Spanish-speaking regions/countries

Second, the exploration of individuals' self-beliefs regarding their creative abilities only constitutes a small part of the machinery of creativity, which is by nature a complex and multidimensional phenomenon. Thus, for an effective evaluation of intervention programs aimed at promoting student creativity, the CSEI-S should be administered along with complementary assessment batteries that measure the remaining

dimensions (process, product, and press) of creativity. Failing to do so could cause results to be affected by single-method bias due to self-report measures.

Third, we did not examine variations of creative self-efficacy over time in the study described in **Chapter five**. Whilst measures of student CSE were taken prior to (t1) and after completion of the 'Innovative Audiovisual Contents and Formats' (IACF) intervention program (t2), the students' wider academic schedule made it impossible to take a third measure several weeks after completion of the program (t3). Future research should conduct longitudinal research to better understand the influence of creative self-efficacy behaves over time, as suggested by Mathisen and Bronnick (2009).

Finally, the author of this PhD dissertation wishes to acknowledge an outstanding personal commitment to the Basque-speaking community; he intends to adapt and validate a Basque language version of the CSEI in future research in order to enable Basque-speaking universities to effectively assess student creative self-efficacy. The contribution aims to support the study of creativity in educational contexts in which the Basque language is used by providing psychometrically solid measurement instruments.

Empirical Limitations and Future Research

Just as in the theoretical and methodological aspects of this dissertation, the present work has faced some empirical limitations. We designed, implemented, and evaluated the IACF intervention program as a contribution to the absence of educational programs aimed at fostering student creative self-efficacy in Communication Studies. This premise implies two potential limitations. On the one hand, whilst the Design Thinking process can be implemented in every academic domain, the specific contents provided throughout the program are inherent to the field of Communication, making its generalization difficult. Hence, these specific contents should be adapted to the corresponding academic domain, if the program is to be implemented it in other contexts.

On the other hand, students from the experimental group in the research described in Chapter five showed a statistically significant enhancement in only two of the seven dimensions of creative self-efficacy (Originality and Field, successively), suggesting there is room for improving the IACF program. Focusing special attention on the CSE dimensions that remained stable could provide the key to reformulating and strengthening certain Design Thinking stages, with the purpose of having a positive impact on more aspects of creative self-efficacy. Therefore, the CSEI-S can be regarded as a useful tool for assessing students' perceived efficacy regarding their creative abilities and can also be used to more finely tune the IACF intervention program.

General conclusion

Having described the various contributions of this dissertation in terms of it theoretical, methodological, and empirical aspects, we would like to end by providing a general conclusion.

Fostering creativity in Higher Education is a necessity, as this 21st century attribute will undoubtedly help students to face obstacles they will encounter during their academic and professional careers, as well as in their personal lives (Ferrari, Cachia, & Punie, 2009:47; Lucas, Claxton, & Spencer, 2012, 2014; Robinson, 2011). Self-efficacy theory (Bandura, 1997b) presumes that creative behaviors and actions are determined by the way individuals perceive themselves. Thus, research on creativity is switching its focus from a process-oriented approach towards the understanding of creative self-beliefs (Beghetto & Karwowski, 2017; Karwowski, Han, & Beghetto, 2019; Karwowski, Lebuda, & Beghetto, 2019). The development of creative self-efficacy could soon prove to be amongst the biggest goals of education systems (Jackson, 2006b).

Universities are relying on creativity training-programs in order to strengthen student creative self-efficacy (Brockhus et al., 2014; Choi, 2004; Intasao & Hao, 2018; Mathisen & Bronnick, 2009; Puente-Díaz et al., 2019). Within this context, the Design Thinking process has the potential for being a suitable educational approach to develop student creative self-efficacy in Higher Education (Jobst et al., 2012; Royalty, Oishi, & Roth, 2012; Royalty, Oishi, & Roth, 2014; Royalty & Roth, 2016). Given the absence of

educational programs aimed at promoting self-judgments of student creativity in the academic domain of Communication Studies, we have introduced the 'Innovative Audiovisual Contents and Formats' program (the IACF program) as an effective means to meet the gap found in the literature. Nonetheless, the benefits of Design The impact of thinking-based intervention programs on the promotion of student creative self-efficacy is yet to be clarified, since mixed results are reported in the literature (Jobst et al., 2012; Ohly, Plückthun, & Kissel, 2017; Royalty, Oishi, & Roth, 2012), and further research is advocated.

This emerging area of research involves additional challenges apart from choosing the most effective educational approach. Thus, educators should also be concerned about the correct assessment of student creative self-efficacy and use suitable tools for such purposes. In contrast with its original conceptualization, creative self-efficacy has been proved to be a multidimensional construct, and, thus, should be measured using valid multidimensional instruments (Abbott, 2010; Alotaibi, 2016; Hung, 2018; Tan, Li, & Neber, 2013). In view of a lack of suitable Spanish-language instruments for measuring creative self-efficacy beyond a single dimension in Higher Education, we have provided the Creative Self-Efficacy Inventory-Spanish (the CSEI-S), a valid and reliable assessment tool with which to measure undergraduates' efficacy beliefs regarding their fluency, flexibility, originality, elaboration, domain, field and personality.

The work carried out in the present dissertation aimed to fill some of the theoretical, methodological, and empirical gaps found in the literature regarding the conceptualization, assessment, and training of student creative self-efficacy in educational contexts. By undertaking this complex challenge, we have found that Design Thinking has the potential for being an effective educational approach to the promotion of student creative self-efficacy in Higher Education. In short, this dissertation is an important contribution to the research, and endorses the study of creative self-efficacy and Design Thinking in Higher Education.

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Appendices

Appendix 1. The Creative Self-Efficacy Inventory-Spanish (CSEI-S).

¿Confías en tus capacidades creativas? (CSE)

Instrucciones: *Valora tu nivel de confianza sobre tus propias habilidades para ser creativo/a. Para ello, asigna un número del 1 al 6. En dicha escala, 1 significa "Desconfío totalmente" y 6 "Confío totalmente".*

1 Desconfío totalmente	2 Desconfío bastante	3 Desconfío algo	4 Confío algo	5 Confío bastante	6 Confío totalmente

1. Genero una gran cantidad de ideas.	1	2	3	4	5	6
2. Se me ocurren muchas soluciones posibles para afrontar un reto.	1	2	3	4	5	6
3. Obtengo varias conclusiones dada una situación difícil.	1	2	3	4	5	6
4. Pienso en muchas respuestas ante un problema.	1	2	3	4	5	6
5. Las ideas que se me ocurren suelen ser diferentes entre sí.	1	2	3	4	5	6
6. Respondo a los problemas de diferentes maneras, siendo cada una de ellas única (genuina).	1	2	3	4	5	6
7. Mientras estoy valorando un problema, pienso en ideas de diferente tipo.	1	2	3	4	5	6
8. Ante los problemas respondo de maneras o estilos diferentes.	1	2	3	4	5	6
9. Cuando hablo con mis amigos/as sobre ideas alocadas, consigo que les suenen razonables.	1	2	3	4	5	6
10. A la hora de contar o solucionar algo, soy capaz de recurrir a mis sueños y/o ilusiones.	1	2	3	4	5	6
11. Asocio mis nuevas ideas o sueños a cosas que ya he aprendido.	1	2	3	4	5	6
12. Suelo ser la primera persona del grupo en lanzar una propuesta original.	1	2	3	4	5	6
13. Encuentro una solución novedosa antes que otras personas.	1	2	3	4	5	6
14. Supero al resto siendo el/a primero/a imaginando una nueva idea.	1	2	3	4	5	6
15. Tengo ideas originales que el resto no tiene.	1	2	3	4	5	6
16. Suelo encontrarle sentido a lo que aprendo.	1	2	3	4	5	6
17. Empiezo a aprender algo, incluso habiendo obstáculos para hacerlo.	1	2	3	4	5	6
18. Aprendo por mí mismo/a a hacer algo nuevo.	1	2	3	4	5	6
19. Soy capaz de convencer al resto de que he creado algo tan novedoso que incluso lo podrían necesitar.	1	2	3	4	5	6
20. Con objeto de convencer de que mi idea es la mejor, soy capaz de identificar un público que esté bien conectado con el resto de la sociedad.	1	2	3	4	5	6
21. Trabajo con otras personas para convencerlas de que lo que hago es lo mejor.	1	2	3	4	5	6
22. Suelo convencer a otras personas de haber hecho una contribución valiosa.	1	2	3	4	5	6
23. Soy capaz de motivarme para generar nuevas ideas.	1	2	3	4	5	6
24. Me divierto creando nuevas ideas tras haber aprendido de otras personas.	1	2	3	4	5	6
25. Siento que, si quiero, se me pueden ocurrir nuevas ideas.	1	2	3	4	5	6
26. Mantengo la ilusión sobre algo, incluso tras haber trabajado en ello durante mucho tiempo.	1	2	3	4	5	6

Appendix 2. Fact sheets of the IACF Program Activities.

Activity 1. What am I good at?
Task Goals − To identify student thinking preferences, strengths, and talents (*Personality*) to build an impactful team.
Task Description 1. **What good is the other?** (40 minutes): − Each person is given a blank sheet of paper and asked to write in the middle a verb or set of verbs they would use to define themselves. They are also asked to mention what they think they are good at. − They fold the page in the middle and in addition to writing their name on the outside, they write on either side of each page: "Social skills?" and "Professional skills?" − The facilitator(s) provide(s) the students with a skill set list: o Social skills: creative, optimistic, open, orderly, empathetic, strong leader, adaptable, brave, collaborative. o Professional profiles: screenwriter, director, camera operator, sound technician, producer, marketing / advertising manager. - Students select words from the two lists and write them on their sheet of paper in the corresponding place, about themselves. 1. Students choose one of the hypotheses, using Menti for such purpose. *Hypothesis A*) I do not know who to work with, but I have (a) possible theme(s). *Hypothesis B*) I do not know which topic to work on, but I know who I would like to work with. *Hypothesis A*: 2. Each person will be asked to write, considering one of the following starting points: − What motivates me most to talk about the social challenges I have worked on? or which one worries me the most? − Do I have any suggestions other than the topics covered? 3. Facilitators try to bring them all to the whiteboard, grouping ideas.

Activity 1 (continuation). What am I good at?

Task Description

Hypothesis B:

1. Students decide who they would like to work with and are asked to organize themselves in teams. Then, they conduct "an X-ray" of their team profile answering the following questions:
    - What are our strengths?
    - And the weaknesses?
    - Are there topics / concerns / ... of individual interest in the team?

2. Problem solving task (20 minutes)

- A letter has arrived from the Pamplona City Council: San Fermin bullfights are losing popularity, and they want to launch a bullfighting marketing campaign. There is a discussion within the team where:
    - The screenwriter, sound technician and marketing / advertising manager are not ready to launch a bullfighting marketing campaign, justifying that it is not appropriate for the company's image, given that they are consolidating in the sector.
    - The director, the camera operator and the producer are in favor of accepting the work, arguing that you are in need of money.
- The team must provide a written answer to the City Council of Pamplona.
- An impartial secretary is designated (not being able to join the discussion), and takes notes about: who has spoken the most? are the rest allowed to speak? Are both sides trying to understand each other?
- Students discuss the team members' attitudes.

Suggested Topics for Discussion

- Which criteria did you follow to organize yourselves in teams, and why?
- How do you know whether you have built an impactful team?

Team Setting	**Duration (90 minutes)**	**Materials**
Small teams of 4-5 students.	40 minutes for the first part, 20 minutes for the problem-solving task and 30 minutes for discussion and closing words.	Pens, sheets of paper.

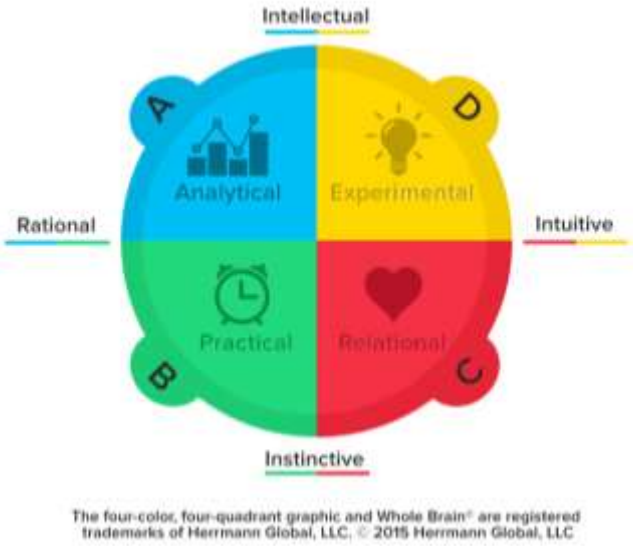
Activity 2. Herrmann Brain Dominance Instrument (HBDI)

Task Goals

- To identify student thinking preferences, strengths, and talents (*Personality*) to build an impactful team.

Task Description

1. *Individually*: Students complete the 116-item online questionnaire and are classified according to the four-quadrant framework of the Whole Brain Model.



Source: https://www.herrmann.com.au/what-is-whole-brain-thinking/

2. After receiving the results, each team discusses with the facilitators the cognitive characteristics within the team.

Suggested Topics for Discussion

- How might each team member's cognitive preferences influence team performance?
- How can you organize yourselves within the team to build an effective and impactful team?

Team Setting	**Duration (90-120 minutes)**	**Materials**
Individually and Small teams of 4-5 students.	60 minutes for filling in the questionnaire and 30-60 minutes of discussion.	The Herrmann Brain Dominance Instrument (HBDI), a computer.

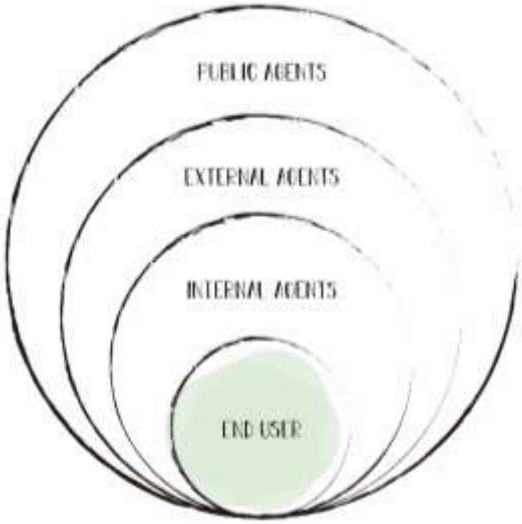
Activity 3. Agents' Map

Task Goals

- To identify the panel of experts and practitioners within the problem space (*Field*).

Task Description

1. *In small teams*: Student teams are given the "Agents' Map" template and they must fill it in. The objective is the identification of potential stakeholders (both people and organizations) relevant to the problem they have chosen and who can be crucial for finding a solution.



2. In addition to brainstorming and placing potential agents (or stakeholders) in the diagram, student teams are asked to draw connections between them by using different arrows that express a close relationship, a weak relationship, formal cooperation alliances, tensions, or broken relationships.
3. Finally, student teams discuss about the map.

Suggested Topics for Discussion

- What are the next steps and actions?
- What are the potential consequences of working with these agents?

Team Setting	**Duration**	**Materials**
Small teams of 4-5 students.	60-180 minutes, depending on the complexity of the problem.	The Agents' Map template and pens.

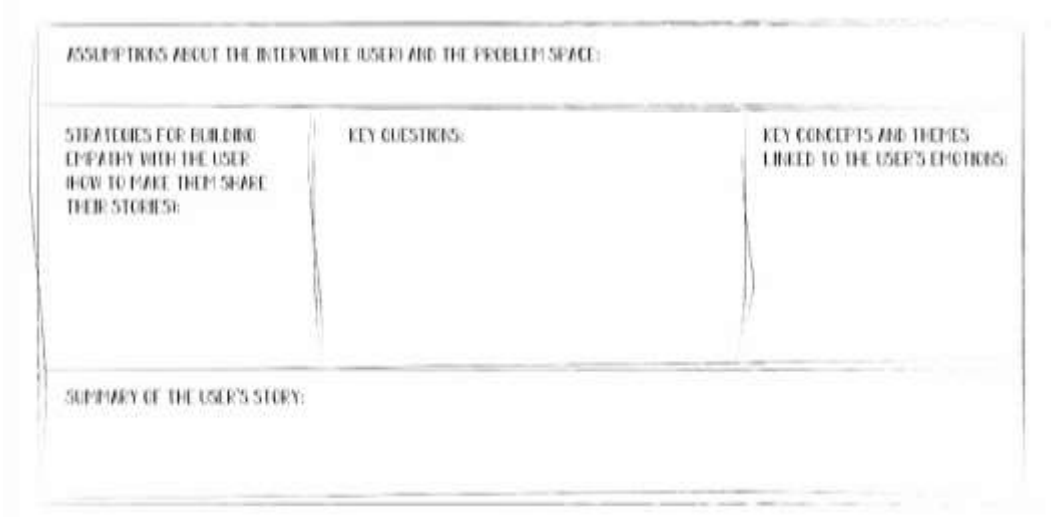
Activity 4. Empathy Interview

Task Goals

- To develop abilities for pre-production and role-division (*Personality*).
- To gain skills for developing empathy with the user (*Personality*).
- To gain knowledge on the user and their needs (*Domain* and *Field*).

Task Description

1. *In small teams*: Student teams must conduct empathy interviews with their users and the different agents involved in the problem space. For each interview, teams will need to fill in the "Empathy Interview" template below:



2. Student teams share the template with the facilitators and if necessary, reframe the content of the first four quadrants (the assumptions, the strategies for building empathy, the questions, and the emotions).
3. Student teams conduct the interviews and provide a summary of the interviewing process with the facilitators. If necessary, they fill in new templates and conduct more interviews.

Suggested Topics for Discussion

- What was the atmosphere created between you and the interviewee like?
- What would you have done differently?

Team Setting	**Duration (variable)**	**Materials**
1-2 students (ideally).	30 minutes for each template. 30-60 minutes for each interview.	The Empathy Interview template, paper, and pens.

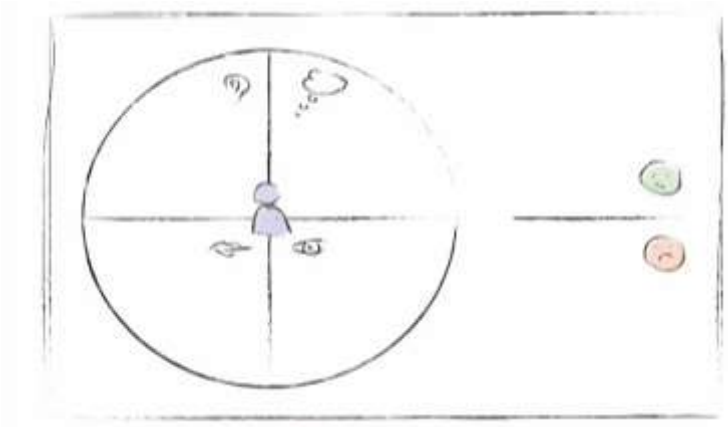
Activity 5. Empathy Map

Task Goals

- To develop abilities for analyzing, filtering, and organizing information (*Personality*).
- To gain knowledge on the user and their needs (*Domain* and *Field*).

Task Description

1. *In small teams*: Students design an "Empathy Map" in a big sheet of paper, as depicted below (60 minutes):



2. They filter, organize, and display visually (written, drawn etc.) all the information obtained from the interviews according to the following criteria:
   - What the user **sees** (their environment).
   - What the user **says** and **does** (their behavior).
   - What the user **hears** (who they speak to).
   - What the user **thinks** and **feels** (their affective states and emotions)
   - The user's **pains** (their biggest problems and challenges) and **gains** (potential opportunities and benefits).
3. *The whole class*: Each team presents their Empathy Map to the rest of the class (5 minutes).

Suggested Topics for Discussion

- What was surprising about your user?

Team Setting	**Duration (90-120 minutes)**	**Materials**
Small teams of 4-5 students.	60 minutes for creating the Empathy Map 5 minutes for each presentation (each team).	Paper and pens.

Activity 6. Persona

Task Goals

- To gain knowledge on the user and their problems (*Domain* and *Field*).
- To foster *Elaboration* skills through the characterization of the user, filling them up with details.

Task Description

1. *In small teams*: Each team creates a person that will represent their target audience, based on the following template (45 minutes):

2. *The whole class*: Each team presents their persona to the rest of the class (5 minutes for each team).

Suggested Topics for Discussion

- Does this personification help your team know your target audience? How? If not, why?

Team Setting	**Duration (60-90 minutes)**	**Materials**
Small teams of 4-5 students.	45 minutes for filling in the template plus 5 minutes for each team's presentation.	The user profile template and pens.

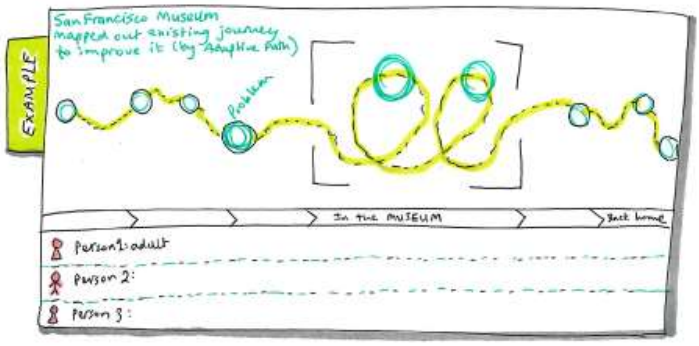
Activity 7. User's Journey Map

Task Goals

- To gain knowledge on the user and their problems through the identification of design opportunities (*Domain* and *Field*).

Task Description

1. *In small teams*: Each student team creates a visual User's Journey Map (60 minutes) based on their persona. For such purposes, they will have to cover three dimensions:
    - **Timeline** (the time interval described).
    - **Touchpoints** (relevant events and actions).
    - **Emotions** (the affective state of the user).



Example of a User's Journey Map (adapted from Jenny Cham)

2. Student teams must identify and specify at least two design opportunities.
3. *The whole class*: Each team presents to the rest of the class their User's Journey Map and explains the design opportunities found (5 minutes for each team).

Suggested Topics for Discussion

- What are the design opportunities identified and how did you find them?
- What other opportunities could there be?

Team Setting	**Duration (90-120 minutes)**	**Materials**
Small teams of 4-5 students.	60 minutes for creating the User's Journey Map and 5 minutes for each presentation.	Paper and pens.

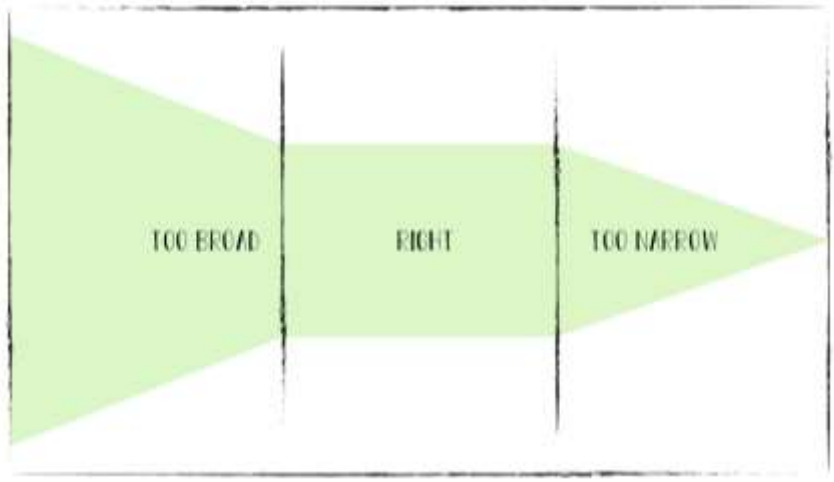
Activity 8. How Might We…? (HMW question)

Task Goals

- To encourage both individual and team self-efficacy in ideational *Fluency*, by setting a starting point for the creation of a solution.

Task Description

1. *In small teams*: Student teams reflect upon the design opportunities identified in the User's Journey Map, by writing down the most relevant needs. Then, they must brainstorm and write down in post-its several "HWM…?" questions where the identified need is explicit, based on the following structure: "How might we (verb) + (noun) + (user)?
    - *Example: How might we create Basque-language innovative content for young people aged between 18 and 25?*
2. Students must place the HMW questions in the corresponding column shown below:



3. Student teams will choose one HMW Question.

Suggested Topics for Discussion

- Is the chosen question too broad, too narrow, or, just right?
- How can you improve the question?

Team Setting	**Duration (90-120 minutes)**	**Materials**
Small teams of 4-5 students.	20 minutes generating the questions, 5 minutes for choosing and 10 minutes for discussion.	Paper, post-its, and pens.

Activity 9. Collaborative story creation

Task Goals

- To encourage both individual and team creativity by means of self-efficacy in ideational *Fluency*, *Flexibility*, and *Originality*, through co-creation and making connections between different concepts.

Task Description

1. *Individually*: Each student selects one of the Seven Basic Plots (Overcoming the Monster, Rags to Riches, The Quest, Voyage and Return, Comedy, Tragedy and Rebirth), and writes it on a sheet of paper. They must come up with a story and, following the Dramatic Structure (the introduction, the conflict, the development, the climax, and the resolution), each student writes an introduction to their story (10 minutes). Then, team-mates exchange their sheets of paper and they write the conflict for another member's story (5 minutes). After doing so, they write the development and the climax and the resolution of the story, switching the sheets of paper among them (5 minutes each time). Finally, each student takes back their original sheet and writes an ending to their story (5 minutes).
2. *In small teams and the whole class*: each student shares their story with their team-mates (20 minutes). Then, we select some of the stories and share them with the whole class. Finally, we open a discussion (30 minutes).

Suggested Topics for Discussion

- How did the blank sheet of paper make you feel?
- Did you feel more confident faced with a blank paper or with one where the story was started?
- What contributions did you make to the other stories?
- How did you react to the work carried out by your team-mates?

Team Setting	**Duration (90 minutes)**	**Materials**
Small teams of 4-5 students.	30 minutes for working in small teams, 30 minutes for sharing the stories with the whole class and 30 minutes for discussion.	Sheets of paper and pens.

Activity 10. The Playground

Task Goals

- To encourage both individual and team creativity by means of self-efficacy in ideational *Fluency*, *Flexibility*, and *Originality*, through co-creation and making connections between different concepts.

Task Description

1. *The whole class*: Everybody watches a music video by OK GO. Then, we watch a TED Talk about how to find a wonderful idea. (20 minutes).
2. Individually: Pick three random objects (or Lego pieces) and write a short story based on these 3 objects (15 minutes).
3. *In small teams*: Students gather in teams of 4 people according to the colors of the objects they picked and share their stories (10 minutes). Then, they co-create a new story considering the 3 objects of each team member (15 minutes).
4. *The whole class*: Each team shares their story with the whole class, and we open a discussion (30 minutes).

Suggested Topics for Discussion

- How did the objects inspire you?
- How did you integrate and combine all 12 objects in order to co-create the story?

Team Setting	**Duration (70 minutes)**	**Materials**
Small teams of 4-5 students.	20 minutes of introduction. 15 minutes of individual work. 25 minutes of teamwork. 30 minutes of sharing and discussion.	Random objects or Lego pieces, sheets of paper and pens.

Activity 11. The Three Bags

Task Goals

- To encourage both individual and team creativity by means of self-efficacy in ideational *Fluency*, *Flexibility*, and *Originality*, through co-creation and making connections between different concepts.

Task Description

1. *In small teams*: There are three bags with different words about a specific area. Each team randomly picks a piece of paper from each bag and brainstorms new audiovisual content or a format, writing it on a piece of paper (15 minutes).
    - Bag 1: **Social Change**: Economy and alternatives, ecology and climate, geopolitics, food and agriculture, cultural diversity, big data, gender, bioethics, social liquidity, migration, technology, educational disruption etc.
    - Bag 2: **Audiovisual formats**: Debates, reportages, contests, fiction, docu-shows, TV, radio, documentaries, cinema, false-documentary, info-shows etc.
    - Bag 3: **New audiovisual trends**: video-marketing, publicity, pod-faster, Instagram, YouTube, web series, multimedia, Twitter, Facebook, audience, Big Data, tsundoku etc.
2. *Between small teams*: Student teams exchange information about their ideas and write down what was most innovative about the other teams' ideas (15 minutes)
3. *Within small teams*: They read the attributes written down by other teams and refine their ideas (5 minutes). Student teams pick one last piece of paper from a fourth bag full of random concepts (e.g. "I'm not me", "future", "at last!", "why not?", "improvisation", "road", "blank page", "it's a lie!" etc.). They must integrate this new concept into their ideas (5 minutes).

Activity 11. The Three Bags (continuation)

Task Description

4. *The whole class*: Each team shares their idea with the rest of the class, and they discuss (20 minutes).

Suggested Topics for Discussion

- How did you make your idea "innovative"?
- How did the feedback provided by other teams impact your first idea?
- How did the last concept influence your final idea?

Team Setting	**Duration (60 minutes)**	**Materials**
Small teams of 4-5 students.	15 minutes of introduction, 15 minutes for time exchange, 5 minutes for feedback and 30 minutes for presentation.	4 bags, paper, and pens.

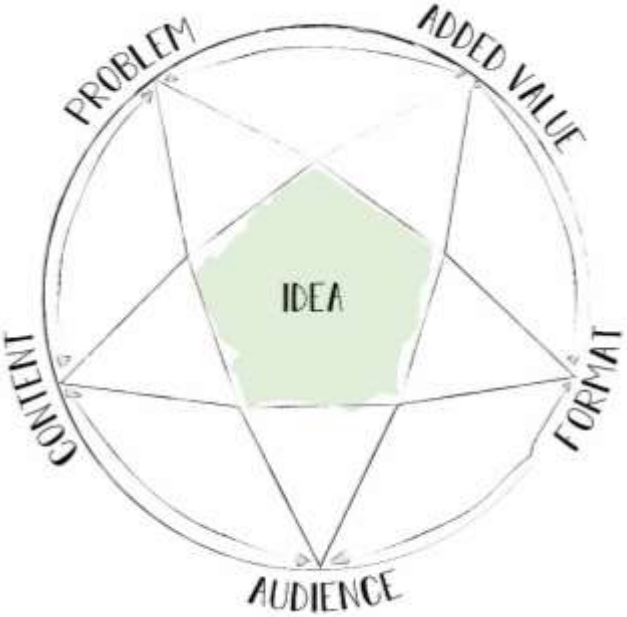
Activity 12. Ideation Sheet

Task Goals

- To encourage both individual and team creativity by means of self-efficacy in ideational *Fluency*, *Flexibility*, and *Originality*, and specially, *Elaboration.*
- To anticipate the human, technical and material needs and to divide the roles within the team according to each member's talents and expertise (*Field* and *Personality*).

Task Description

1. *In small teams*: Student teams must fill the Ideation Sheet template provided (60 minutes)



PROBLEM
INITIAL PROBLEM
PROPOSED SOLUTION

ADDED VALUE
THE ADDED VALUE FOR:
- SOCIETY.
- THE AUDIOVISUAL FIELD.

IDEA
IN A HEADLINE.
IN A PARAGRAPH.
EXPIRATION DATE.

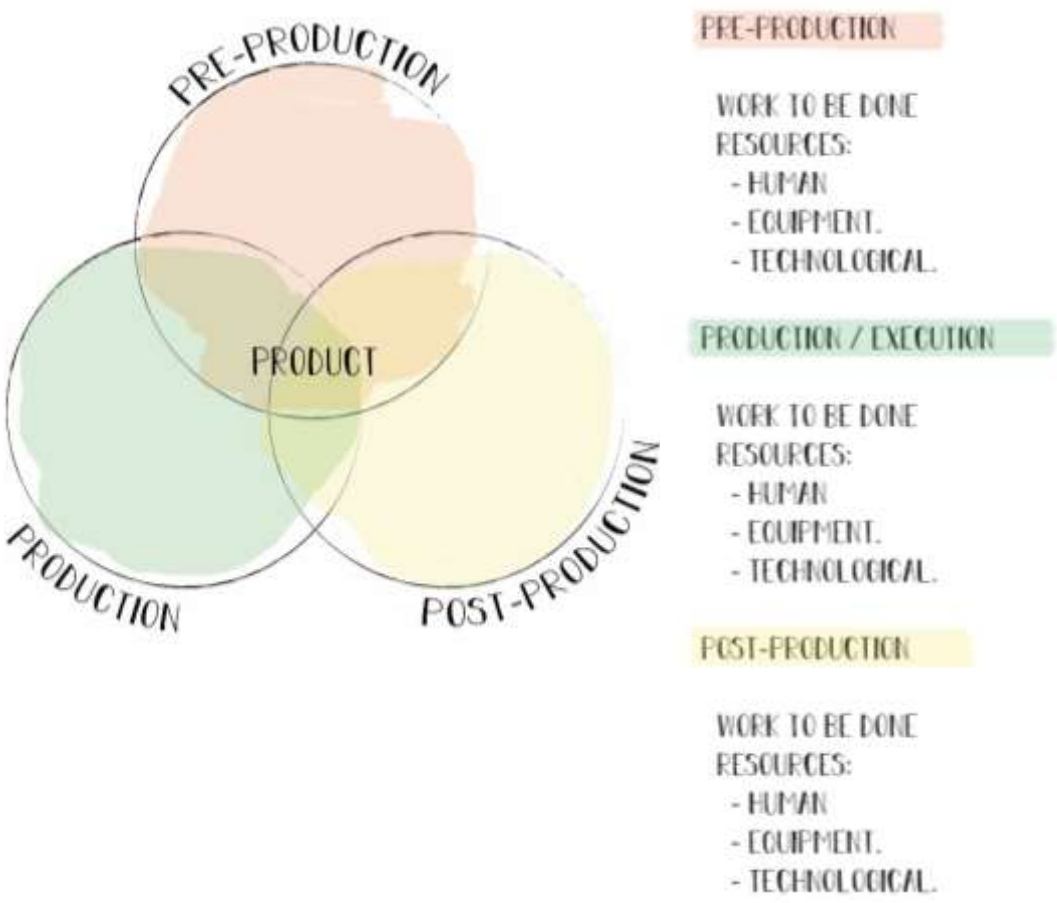
CONTENT
PLOT.
CHARACTERS.
TIME AND PLACE.

FORMAT

AUDIENCE
TARGET AUDIENCE.
- CHARACTERISTICS.
- WHAT ARE THEIR NEEDS?
- WHAT NEED DOES THIS PROJECT MEET?
EXTENDED AUDIENCE.

Activity 12. Ideation Sheet (continuation)

Task Description



- *The whole class:* All teams present their ideas in 2 minutes to the rest of the class (20 minutes).

Suggested Topics for Discussion

- What is the added value for society?
- What is the added value for the audiovisual field?

Team Setting	**Duration (100 minutes)**	**Materials**
Small teams of 4-5 students	10 minutes of introduction 60 minutes for filling the template 20-25 minutes of presentations 5 minutes for closing words.	The ideation sheet template and pens.

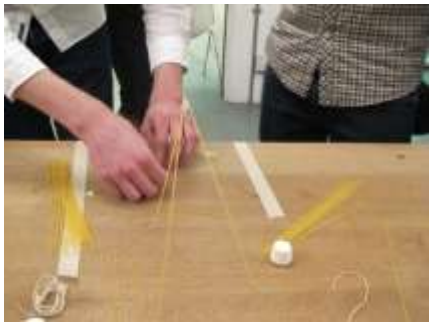
Activity 13. Marshmallow Challenge

Task Goals

- To encourage both individual and team creativity by means of self-efficacy in ideational *Fluency*, *Flexibility*, *Originality* and specially *Elaboration* through co-creation and hands-on experiences.

Task Description

1. *In small teams:* Student teams must build the highest stand-alone tower in the class. For this purpose, they have two conditions:
   a. They will have to build the tower with the materials provided, namely, 20 strands of spaghetti, one marshmallow, 1m of adhesive tape and 1m of cord.
   b. They will have to place the marshmallow on top of the tower.



One team performing the Marshmallow Challenge.

2. *The whole class*: Once the time is up, the facilitator will announce the winner, and count how many stand-alone towers were built. Then, an open discussion will commence between teams.

Suggested Topics for Discussion

- Why do you think you succeeded / failed at building the tower?
- What would you do differently if you were to build the tower again?

Team Setting	**Duration (30 minutes)**	**Materials**
Small teams of 4-5 students.	3 minutes of introduction 17 minutes to build the tower 20 minutes for discussion.	20 strands of spaghetti, one marshmallow, 1 m of adhesive tape and 1m of cord.

Activity 14. Dark Horse

Task Goals

- To encourage both individual and team creativity trying unusual approaches to problems (ideational *Fluency*, *Flexibility*, and *Originality).*
- To deepen the understanding on the user and their needs (*Domain* and *Field*) through the reaction to a "wild idea".

Task Description

1. *In small teams*: The facilitator asks student teams to perform a quick brainstorming session taking as a starting point "What if…" questions or prospective scenarios for the suggested solution (e.g. what will the solution be like in 20-year time?) (20 minutes). Then, the facilitator provides students with various rapid-prototyping materials (Paper, pens, scissors, adhesive tape, Lego bricks etc.) and asks students to build their dark horse prototype (20 minutes). Then, one member of each team stays in their place (the secretary), while the rest moves to another team's place; the secretary must tell to the other team what their prototype is about, and write down the feedback provided by the other team. (5 minutes with each team). Teams go back to their original places and the secretary sums up the feedback by other teams to their teammates (5 minutes).
2. The *Dark Horse* refers to the candidate in a race (in athletics, politics etc.) who is completely unknown and unexpected win. The Dark Horse prototype aims at carrying out peculiar experiments at the early stage of the project, in order to test user reaction to approaches that are not usual.

Suggested Topics for Discussion

- How did people react to your prototypes?
- What can you keep and discard from this prototype for the final solution?

Team Setting	**Duration (variable)**	**Materials**
Small teams of 4-5 students.	20 minutes for brainstorming, 20 minutes for building the prototype, 20-40 minutes for feedback	Paper, pens, scissors, adhesive tape, Lego bricks etc.

Activity 15. Prototyping Task

Task Goals

- To promote student self-efficacy in their *Elaboration* skills through the co-creation of a physical artifact.

Task Description

1. *In small teams*: Student teams must build a prototype of the chosen idea from the Ideate phase. For such purpose, facilitators will introduce different types of prototypes (20 minutes):
    - Sketch.
    - Mock-up.
    - Role playing.
    - Storyboard.
    - Video ad/teaser.
2. Facilitators will provide student teams with rapid prototyping material, in addition to audiovisual equipment and students will be given one week to build their prototypes
3. In the end, teams will present their prototypes to the rest of the class (10 minutes each presentation, max.) and will ask their classmates for written feedback in which they will have to specify the strengths and the opportunities for improvement (5 minutes for each team max.).

Suggested Topics for Discussion

- What did you learn about your chosen idea through the prototype

Team Setting	**Duration (variable)**	**Materials**
Small teams of 4-5 students.	20 minutes of instruction, one week for building the prototype and 90-180 minutes for presentations and feedback.	Rapid prototyping material (paper, pens, scissors, adhesive tape, Lego bricks etc.) and audiovisual equipment (cameras, tripods, microphones, lightning material etc.)

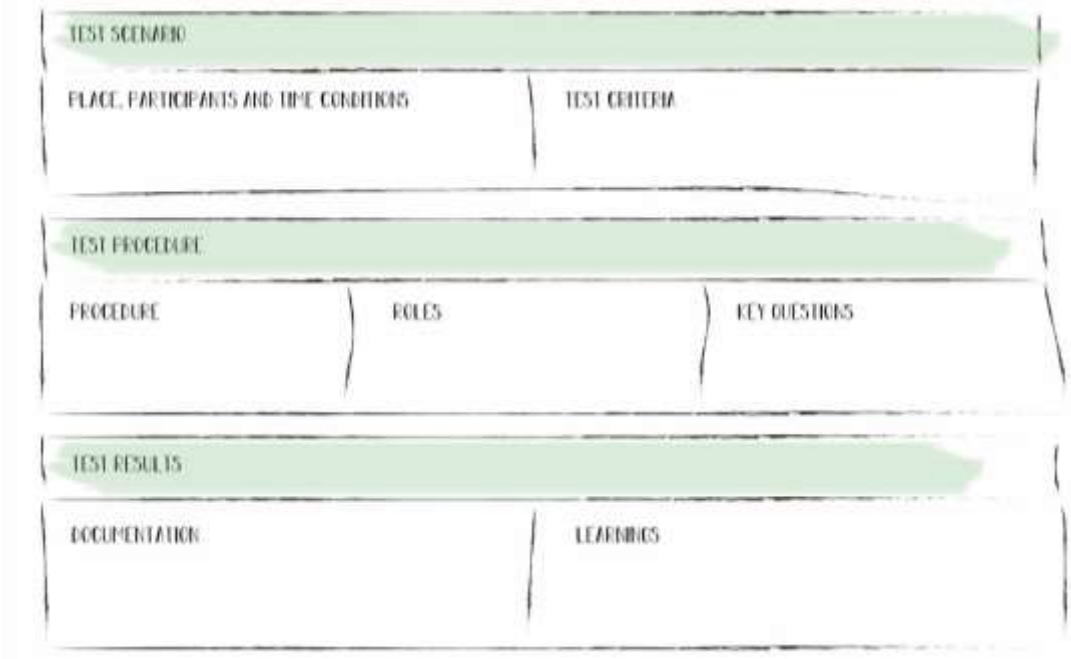
Activity 16. Testing the prototype

Task Goals

- To develop abilities for pre-production and role-division (*Personality*).

Task Description

1. *In small teams*: Student teams must plan the testing covering the following points:
    - Test scenario (the place/people/time conditions, and the evaluation criteria for the testing).
    - Test procedure (the roles of each teammate and questions to be asked).
    - Test results (written or graphic documentation).
2. For such purpose, the facilitator will hand in each student team a Testing Sheet template and ask them to fill it in (20-30 minutes)



3. Student teams must conduct the test (30-60 minutes)

Suggested Topics for Discussion

- None.

Team Setting	**Duration (50-70 minutes)**	**Materials**
Small teams of 4-5 students.	20-30 minutes for planning the test 30-40 minutes for performing the test.	Paper, pens, camera, the prototype, testing sheet template.

Activity 17. Feedback Capture Grid

Task Goals

- To develop abilities for analyzing, filtering, and organizing information (*Personality).*
- To deepen the understanding on the user and their needs (*Domain* and *Field*) through the reaction to the prototype.

Task Description

1. *In small teams*: The facilitator gives each student a "feedback capture grid" template and asks them to fill it in considering the insights obtained in the testing, according to the what the user likes, what the user wishes, the most relevant quotations and the ideas for improvement arisen (30-45 minutes).

2. *The whole class:* Each team presents to the rest of the class their feedback capture grid (5 minutes each presentation) and hen, an open discussion will commence between teams.

Suggested Topics for Discussion

- How has the testing contributed to you prototypes?
- What did you learn about your user that you did not know so far?

Team Setting	**Duration (70-100 minutes)**	**Materials**
Small teams of 4-5 students.	30-45 minutes for filling the template in and 5 minutes for each presentation and 10 minutes for discussion and closing words.	The feedback capture grid, pens.

Activity 18. Final Report (Logbook)

Task Goals

- To encourage both individual and team creativity by means of self-efficacy in ideational *Fluency*, *Flexibility*, *Originality* and specially *Elaboration* through co-creation and hands-on experiences.

Task Description

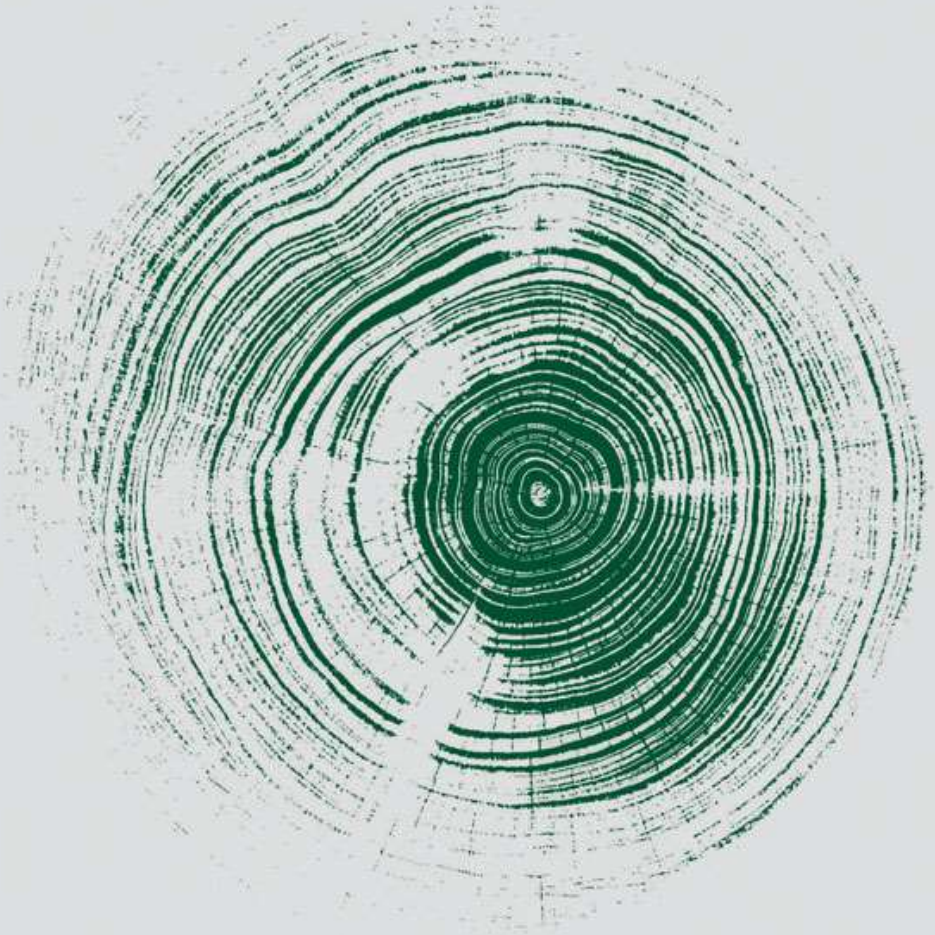
1. *In small teams*: Student teams are asked to create a final report in the form of a handmade creative logbook in order to describe both the whole working process and the final prototype. They are encouraged to draw, print, and stick pictures etc. (one week).

2. *The whole class*: Students will place their logbooks within the class creating an exhibition.

Suggested Topics for Discussion

- None.

Team Setting	**Duration (one week)**	**Materials**
Small teams of 4-5 students.	5 days, 8 hours each day.	Paper, scissors, adhesive tape, post-its, pictures etc.



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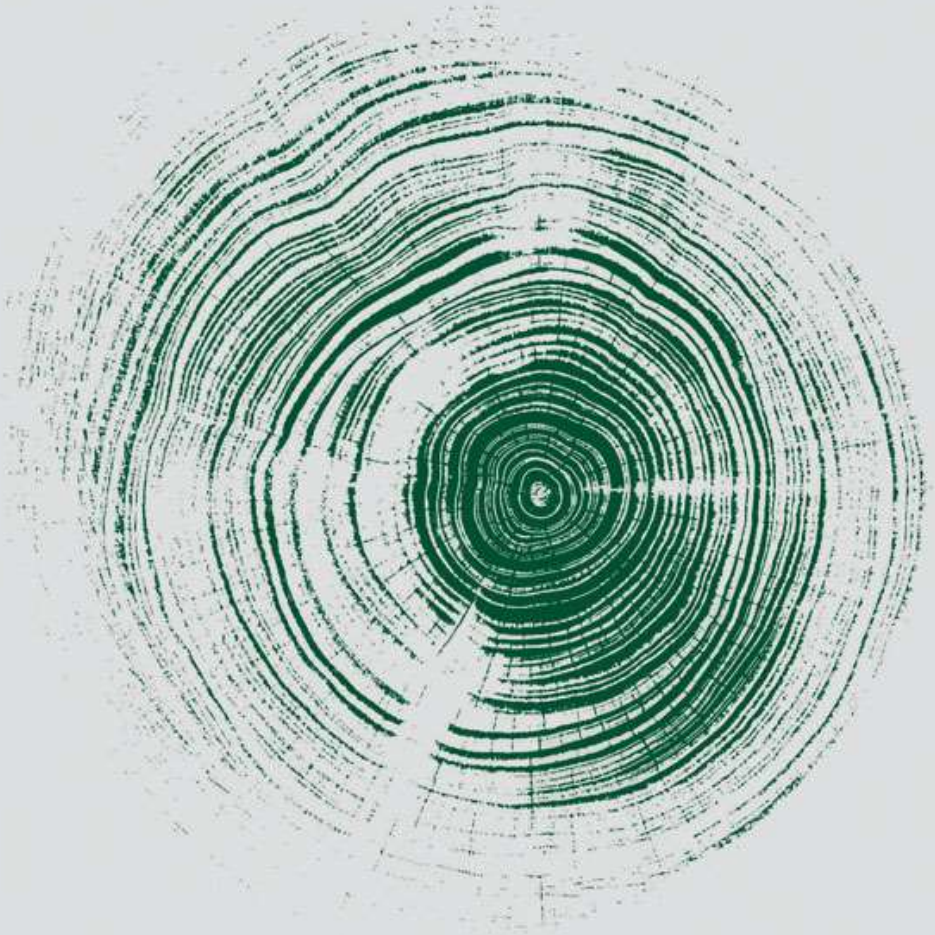

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