



DOCTORAL THESIS

*Exploratory Analysis of Social
Representations, Academic and Media
Discourses of Women in STEAM: Lithuania as
a Case Study in the European Context*

Author:

Tatiana Buelvas Baldiris

Supervisors:

Dr. Rainer Rubira García

Dr. Rasa Pocevičienė

Tutor:

Dra. Sonia Nuñez Puente

**Doctoral Program in Interdisciplinary Gender Studies
International Doctoral School**

2023

Exploratory Analysis of Social Representations, Academic and Media Discourses of Women in STEAM: Lithuania as a Case Study in the European Context

Tatiana Buelvas Baldiris (ORCID 0000-0002-0156-8883)

Director: Dr. Rainer Rubira García (ORCID 0000-0002-5667-6080)

Co-director: Dra. Rasa Pocevičienė (ORCID 0000-0003-2576-6443)

Tutor: Dra. Sonia Nuñez Puente (ORCID 0000-0002-2100-3230)

Doctoral Program in Interdisciplinary Gender Studies

Rey Juan Carlos University, 2023.



Exploratory Analysis of Social Representations, Academic and Media Discourses of Women in STEAM: Lithuania as a Case Study in the European Context © 2023 by Tatiana Buelvas Baldiris is licensed under Attribution-NonCommercial-ShareAlike 4.0 International

*To all women:
Dreams, determination, and dedication are powerful forces that bring us closer to a new self-awareness waiting to be discovered. You are worthy of achieving, so go for it!*

*“People are often unreasonable, illogical, and self-centred;
Forgive them anyway.
If you are kind, people may accuse you of selfish, ulterior motives;
Be kind anyway.
If you are successful, you will win some false friends and some true enemies;
Succeed anyway.
If you are honest and frank, people may cheat you;
Be honest anyway.
What you spend years building, someone could destroy overnight;
Build anyway.
If you find serenity and happiness, they may be jealous;
Be happy anyway.
The good you do today, people will often forget tomorrow;
Do good anyway.
Give the world the best you have, and it may never be enough.”*

Mother Teresa

ACKNOWLEDGEMENTS

To God,

My spiritual relationship brings peace to my heart and soul, as much as angels of wisdom constantly come into my life to guide me. I can't help but feel grateful for everything I have experienced while writing this thesis.

To my beloved family,

Thank you for believing in me and for your constant encouragement. You were the driving force that kept me going, even in the most challenging moments. Thank you for your calls and messages from Colombia; they have been a beacon of light on my path.

To my mother, sisters, aunts, and cousins, for being my refuge and source of inspiration. I am proud to come from a family of strong, self-assured women who always seek to impact society with their contributions positively.

To my Tom & family, thank you for embracing me, for giving me words of encouragement, and, above all, for welcoming and accepting me with love and affection. Thanks to you all, I now have a third home in Lithuania.

To you, Tom. I am infinitely grateful for all the love and support you have provided me from beginning to end. For our endless conversations and for supporting me in absolutely everything (even my bad ideas), you are the best. Thank you, my love, for being an angel in my life.

To my friends in Colombia, Spain and around the World,

I can't help but smile when I think of all the shared moments, laughter, endless calls, celebrations, fights, and tears we've shared during this time. Every conversation, gesture, and word of encouragement has given me the necessary push to reach this goal. Your friendship is a true treasure.

To my teachers and mentors,

Rai and Rasa, your wisdom and guidance have been fundamental to my success on this journey. I appreciate your dedication to teaching and the solid support through which we have reached our goal together. Thanks for your patience in this process and every piece of advice that led us to where we are right now. Also, I'm so grateful to you for being a shoulder to lean on, for your comprehension and for your warmth.

Thank you for being exemplary mentors and investing time and energy in my academic, professional, and personal development.

List of Acronyms and Abbreviations

STEAM	Science, Technology, Engineering, Arts, Mathematics.
EC	European Commission
EP	European Parliament
GM	Gender Mainstream
EIGE	European Institute for Gender Equality
SLR	Systematic Literature Review
CDA	Critical Discourse Analysis
TPI	Theory of Professional Ideologies
TRC	Theory of Role Congruency
TSR	Theory of Social Representations
SRPR	Systematic Research Project Reviews
ERA	European Research Area
OECD	Organisation for Economic Co-operation and Development
SDGs	Sustainable Development Goals
ICT	Information and Communication Technology
H2020	Horizon 2020
NFTs	Non-Fungible Token
RPO	Research Performance Organization
RFO	Research Funding Organization
GEP	Gender Equality Plans

TABLE OF CONTENTS

ABSTRACT.....	3
RESUMEN.....	4
1. INTRODUCTION.....	6
1.1. Thesis Justification	7
1.2. Objectives and Research Questions.....	11
2. STATE OF THE ART.....	13
2.1. Epistemological Surveillance and Scientific Discourse	13
2.2. Theory of Professional Ideologies in STEAM.....	14
2.3. Gender Mainstream and European Projects.....	15
2.4. Women’s Social Representation and Role Congruency	16
3. METHODOLOGY.....	19
3.1. Research Plan & Methods	19
3.2. Incardination of Publications	26
4. GLOBAL RESULTS	28
5. DISCUSSION & CONCLUSIONS	32
6. LIMITATIONS AND FUTURE RECOMMENDATIONS	36
7. SÍNTESIS EN ESPAÑOL / SPANISH SUMMARY.....	39
8. COMPENDIUM OF PUBLICATIONS.....	44
8.1. “Scholarly Discourse About Women in the STEAM Fields: An Exploratory Study on Scientific Literature”	45
8.2. “EU Projects on Women in STEAM Sectors: Assessing Gender Gap in Science”	47
8.3. “Female Leadership Portraits in Commercial Movies: Gender Social Representations from the STEAM Sector”	64
8.4. “Social Representations on Lithuanian Women Leaders in the STEAM Fields: A Critical Discourse Analysis”	66
9. REFERENCES.....	68
10. ANEXXES.....	75

Tables and Figures

1) In the thesis report

Figure 1. Graphical summary of the thesis structure. / **pp. 12**

Table 1. SLR results on mapping studies/projects related to promoting women in STEAM. / **pp.22**

2) Publication 1:

Table 1. Relationship of Journals, number of publications, and countries. / **pp. 923**

3) Publication 2:

Figure 1. Definition and implementation phases of the SRPR method. / **pp. 50**

Figure 2. Acronyms of the 30 projects. Blue (CORDIS), purple (ERASMUS+), green (KEEP), and orange (new projects). / **pp.56**

Table 1. Results per database and filtered with selection and quality criteria. / **pp.55**

Graphic 1. Database disaggregated data on the type of interventions performed. / **pp.57**

4) Publication 3

Figure 1. Bechdel Test Results. / **pp. 7**

Figure 2. Bechdel test vs. genre categories. / **pp. 8**

ABSTRACT.

The COVID-19 pandemic not only accelerated the global digital transformation in STEAM (Science, Technology, Engineering, Arts, and Mathematics) sectors but also exacerbated the gender gap in these areas. Women face difficulties in accessing and advancing in STEAM industries due to factors such as the lack of female role models, gender stereotypes, gender segregation, lack of confidence, and the impostor syndrome. This research focuses on Europe, where gender equality is a priority, and aims to explore how the representation of women in STEAM has been addressed in academic discourse and the media, with Lithuania as a case study. The specific objectives include analysing academic discourse on women in STEAM; exploring European projects promoting women in STEAM through systematic project review; delving into the representations of female scientists in commercial cinema using the Bechdel test and Greimas' Actantial method; and finally, conducting a Critical Discourse Analysis of women leaders in STEAM in Lithuania. The results reveal: 1) An increase in research on women in STEAM, but also challenges such as gender imbalances in research authorship. 2) Academia has contributed, but a more action-oriented approach is needed. 3) European projects primarily focus on education and gender equality plans in STEAM organisations. 4) Regarding the research on cinema representation, it shows how media shapes public perceptions of women in STEAM. 5) The last publication highlights the agency and resilience of Lithuanian women in STEAM who have overcome gender norms. In summary, progress has been made in understanding gender inequalities in STEAM, but a multidisciplinary approach and new epistemological perspectives are needed to achieve lasting change in gender representation in these historically male-dominated fields, opening up participation and leadership opportunities for women in these sectors.

Keywords: Women; STEAM; Social Representations; Discourse; Media; Lithuania; Europe.

RESUMEN

La pandemia del COVID-19 no solo aceleró la transformación digital mundial en los sectores STEAM (Ciencia, Tecnología, Ingeniería, Artes y Matemáticas), sino que también agravó la brecha de género en estas áreas. Las mujeres tienen dificultades para acceder y progresar en las industrias STEAM debido a factores como la falta de modelos de liderazgo femeninos, los estereotipos, la segregación de género, la falta de confianza y el síndrome del impostor. Esta investigación se centra en Europa, donde la igualdad de género es una prioridad, y pretende explorar cómo se ha abordado la representación de las mujeres en STEAM en el discurso académico y en los medios de comunicación, con Lituania como estudio de caso. Los objetivos específicos incluyen analizar el discurso académico sobre las mujeres en STEAM; explorar los proyectos europeos que promueven a las mujeres en STEAM mediante la revisión sistemática de proyectos; profundizar en las representaciones de las mujeres científicas en el cine comercial utilizando el test de Bechdel y el método Actantial de Greimas; y, por último, realizar un Análisis Crítico del Discurso de las mujeres líderes en STEAM en Lituania. Los resultados revelan 1) Un aumento de la investigación sobre las mujeres en STEAM, pero también retos como los desequilibrios de género en la autoría de la investigación. 2) El mundo académico ha contribuido, pero se necesita un enfoque más orientado a la acción. 3) Los proyectos europeos se centran principalmente en la educación y los planes de igualdad de género en las organizaciones STEAM. 4) En cuanto a la investigación sobre la representación cinematográfica, muestra cómo los medios de comunicación configuran la percepción pública de las mujeres en STEAM. 5) La última publicación pone de relieve la agencia y la resistencia de las mujeres lituanas en STEAM que han superado las normas de género. En resumen, se ha avanzado en la comprensión de las desigualdades de género en STEAM, pero se necesita un enfoque multidisciplinar y nuevas perspectivas epistemológicas para lograr un cambio duradero en la representación de género en estos campos históricamente dominados por los hombres, abriendo oportunidades de participación y liderazgo para las mujeres en estos sectores.

Palabras clave: Mujeres; STEAM; Representaciones Sociales; Discurso; Medios de Comunicación; Lituania; Europa.

1. INTRODUCTION

The COVID-19 pandemic and the fast digital transformation forced world economies to convert almost every task or work position into one that could be done virtually, by a robot, an AI model, and sometimes remotely. At the same time, this brought to light that women around the globe are not prepared for such rapid transformations, as they do not have the necessary skills, technical knowledge, and access to resources or technologies to ensure them a spot in today's economy. This thesis focuses on European countries where women's struggles during these critical times have deepened, and it requires further solutions to achieve gender equality in STEAM, boosting women's life plans.

Science, Technology, Engineering, Arts, and Mathematics (STEAM)¹ are currently the most critical careers shaping the world's interactions at all levels: political, economic, social, cultural, and more; for instance, now people use machines to pay by themselves in supermarkets; online cards to avoid cash; there are new digital currencies as bitcoins, NFTs, as well as apps to meet people. The market is changing, and women are far from matching its needs; in fact, "women make up 52% of the European population, and the majority of tertiary graduates in the EU; yet only 2 out of 5 scientists and engineers are women and only 18% of the specialist in ICT" (EC, 2022, p. 2), this referring only to one of the multiple careers that cover STEAM, therefore the relevance of analysing this issue with a gender perspective.

Gender equality is a central and critical objective for the EU; "the basic recognition of human rights for women and girls is essential for them to achieve empowerment and their full potential in a sustainable and inclusive society" (European Parliament, 2021, p. 3). Additionally, the Sustainable Development Goals (SDGs), aiming to leave no one behind, reinforce that commitment through goals to make all nations accountable for that change. Nevertheless, gender inequality in STEAM issues is complex and rooted in society in many ways, such as lack of role models, gender stereotypes, socialised belief systems, and more (Kuschel et al., 2020).

Some authors claim the main reasons for female under-representation and leadership in STEAM sectors is due to "gender segregation that becomes an issue for labour market policies" (Schlenker, 2015, p. 1); lack of role models; confidence gap or impostor syndrome (Ellis et al., 2016; Mayo et al., 2012); Mathilda effect; glass ceiling; glass cliff; gender stereotypes and bias (Botella et al., 2019; Carr et al., 2019; Denend et al., 2020; Makarem & Wang, 2020); imbalances in personal work-life plans (Botella et al., 2019; Carr et al., 2019; Makarem & Wang, 2020; Ricci et al., 2021); unequal opportunities (Botella et al., 2019); "sexual harassment reported issues in STEAM facilities, including schools, universities, and workplaces further excluding women from these sectors" (EP, 2021, p. 4)

The roots of these problems are at the centre of the STEAM field as a profession. Considering this, the stereotype threat explains a phenomenon that endangers women's confidence as a confirmation of one's fear of negative stereotyping provided by a group to which they belong (Cheryan, 2017), which consequently leads to the leaky pipeline (Berryman, 1983), where women already

¹ More information is provided about the origin of STEAM in the first and second publications.

doubt on their abilities and competencies to perform at an optimal level and decide not to continue a career path in those fields.

Even though the gender gap in STEAM cannot be fully explained based on gender differences in abilities (OECD, 2012), young girls and boys pursue a career in these fields due to personal expectations over the labour market (OECD, 2012). Evidence suggests sociocultural accumulated aspects that impact personal motivations and cognitive ability for women to choose or not math-intensive career choices (Wang et al., 2017). As a result, the issue is multi-dimensional, considering many scenarios of young girls and women's lives, public and private, where gender differences are present, acting as a sort of filter on career choices consciously or unconsciously.

As part of the social contract in which public institutions intervene to contribute to solving social issues, the European Parliament recognised that “closing the gender gap in STEAM careers can contribute to an increase in EU GDP per capita by 2,2% to 3,0% by 2050 [...]; this constitutes a step towards gender equality and the fulfilment of women's and girls' human rights, having an impact in reducing the gender pay and gender pension gaps” (EP, 2021, p. 4). As a result, several initiatives, budgets, programs, and projects are developed yearly to improve gender equality in European countries; some of the outstanding priorities in this area are the European Research Area (ERA) and Horizon 2020 (H2020), to mention a few.

European institutions started to place a wide range of issues that impact EU policymaking towards achieving women's representation in many areas, but especially the STEAM sector, thanks to social movements that brought the gender mainstream approach to the European Commission to encourage supranational actors with a specific and strategic agenda. However, the implementation of the gender mainstream approach presents three main issues: the supranational level of the Commission Bureaucracy, the intergovernmental level of the Council, and lastly, the member-state level. According to the framing process, the dominant frames on the gender gap issues placed on the policy proposals can achieve the full or partial interest for implementation across EU countries depending on political moves, knowledge on the topic, and binding or not binding strategies, which becomes a downturn to gender gap efforts.

Lastly, aiming to improve women's representation and leadership in STEAM is a tough call, yet not impossible. For this reason, it is essential to break down the issue and try to understand how academics and media representations have shaped the views on the field through epistemological surveillance in connection with professional ideologies and gender theories, along with a corpus of concepts that are further discussed in state of the art, which helps to reflect deeply in the power relations and their mechanisms that finally, perpetuate the gender disparities in STEAM.

1.1. Thesis Justification

While numerous studies try to describe the origin of the underrepresentation of women in STEAM careers, there is a fact present in all industries. Despite humans

being free of will and choice, the tensions created by the system push individuals away from a dignified life instead of a proper redistribution of resources for everyone, limiting their access to fundamental human rights. Accordingly, due to the fast digital transformation and market labour changes, such tensions are more significant now, especially for women.

Considering the previous, my motivation with this thesis is to understand better the power dynamics that move within STEAM fields, how bias and stereotypes are ingrained in these industries, and how we, as academics, are framing this problem to make some future recommendations that impact positively in the research focused on women in STEAM.

The gender gap is not present in all STEAM careers (Bian et al., 2018; Cheryan et al., 2009). For instance, the gap is persistent in careers like computer science, physics, math, and surgery regarding senior teachers and researchers (Holman et al., 2018), as well as in leadership positions in research organisations due to challenges at work (Nicholson, 2015; Schetlzer et al., 2014). In any given context, Universities play a crucial role in driving new behaviours and understandings within sectors of society. To be able to propose measures and policies to governments, Universities first need to identify the situations that impact students' lives in different ways concerning gender equality (García-Holgado et al., 2020, p. 1825).

“The lack of role models, the stereotype threat and lack of interest is part of the underrepresentation of women in STEAM” (Kaplan-Sayi et al., 2023, p. 1430); in fact, on a recent interview written by Gjersoe in “The Guardian” UK talks about: “Why do so few girls study STEM subjects?”, in brief, she describes that the gender gap is a social construct and that results suggest there are gendered notions of intelligence that women picked very early in life and start having effect in the interests they pursue later (Gjersoe, 2018), this informs about the relevance of role models, as it provides inspiration and can help women to prove that all people can achieve their goals and be successful (Hill et al., 2010).

Schools and universities are gearing up to validate young girls' knowledge, improving their confidence, self-efficacy, and self-esteem. In addition, the STEAM industry, with its companies (SIEMENS, BP, YARA, and more), contributes to challenging STEAM stereotypes that threaten gender balance with its programs (Silim et al., 2014). Accordingly, there is sufficient evidence in the second publication of this thesis on the funds, programs, and projects executed in European countries in schools and universities fostered by the European Commission trying to tackle women's representation, participation, and leadership in STEAM.

Linked to role models, women's social representation and leadership in STEAM are fundamental to encouraging the active participation of women in the sector. For this reason, mediations in the cinema on how women are portrayed are relevant as they inspire people and make them feel reflected through the big screen. For example, female scientists are depicted in the movies studied in publication 3 as single, strong, intelligent, but not necessarily feminine, consumed by work, and often neglecting personal relationships, reinforcing gender bias and stereotypes.

Moreover, a crucial aspect analysed in publications 3 and 4 is the influence of family background, as having a parent who works in the STEAM field increases the probability of choosing such a field of study as a career path (Leslie et al., 1998; Jackson et al., 1993), which is an aspect deeply overviewed through the Lithuanian interviews in this thesis.

The social representation displayed in movies demonstrates that STEAM as a career path is more suitable for a specific gender. As men traditionally occupy positions in STEAM areas, people associate these sectors with masculine figures [...] As a result, women are regarded as unfitting and are less likely to thrive, get endorsed, or even occupy a management position in sectors with male authority (Meyer et al., 2015). Surprisingly, women who reach leadership positions have less power and fewer rewards than men (Lips, 2020). Consistently with this evidence, occupational segregation and wage gap² (Schlenker et al, 2015; Wahrenburg et al, 2007) are tied to the field, making this a problem not only for gender equality but for labour market policies.

The European Commission has been implementing measures from the supranational level that reduce gender incongruences in STEAM. Nevertheless, nothing will change without reforms in education and work that involve mentoring, academic publishing, better parental leave conditions, guaranteeing more resources in the workplace, and more (Holman et al., 2018; Duch et al., 2013; Shaw et al., 2012). It is worth noting that despite the frictions and constant discouragement these incongruencies represent for women, some have succeeded despite facing inaccurate and derogatory assumptions about their skills, knowledge, or education, as exposed in the second publication.

Thus, the fourth publication illustrates the lives of real women who succeeded within such stereotypes in these fields in Lithuania. The case study is chosen for Lithuania's involvement in building up the gender equality ecosystem, "legislations, laws and public institutions in Europe since 1999, in fact, one of the first European countries to do it" (Zaleniene et al., 2013, p. 284). As an early adopter of gender equality legislation in Central and Eastern countries and one of the first European member states with a female prime minister (EIGE, 2022, p. 47)., Lithuania has implemented proactive changes toward equal opportunities between men and women. Therefore creating a commitment to address gender disparities at all levels of society.

In 2007, the European Institute of Gender Equality (EIGE) was established in Lithuania, emphasising this country's dedication to advancing women's rights. Accordingly, EIGE is a relevant institution providing research, policy recommendations, sensibilisation, and more concerning to Lithuanians and all European countries on women's rights. More information is provided in the first and fourth publications. Lithuania seemed a best practice example to overview this combination of efforts that create some urgency in society, government, public, private, and academic sectors.

² Wage gap refers to the difference in the income made when pursuing a career in one or another sector. E.g., the Humanities are not paid in the market like engineering or computer science.

Regarding the periods analysed throughout this compendium of publications thesis, it is considered from 2000 until now as there has been a notable increase in sensitivity and attention towards the subject in question, driven by international organisations and global high-level meetings, marking a pivotal period of change at the turn of the century. At the core of these conversations, the European Commission, UNESCO, and other organisations created several high-level meetings to discuss the future of such careers and industries and the role of women in them. Further information is available in the first publication.

Nevertheless, research and meetings were conducted to diagnose the situation of women in the member states and their employment in the STEAM sector. Interest rises in these occupations as economies are increasingly knowledge-driven, and companies are currently experiencing fierce competition over the workers available in the market (Schlenker, 2015, p.2). Among the relevant studies first carried out is “Women and Scientific Employment: Mapping the European Data,” also known as a Glover Directory (Glover, 2020), which analyses the subject’s situation in European countries.

Evidence suggests that from “1976-1985 United Nations declared “Decade for Women: Equality, Development and Peace” the attention was placed on women’s role in science and technology” (UNESCO, 2007, p. 11). This attentiveness increased in 2000, when gender equality became one of the eight Millennium Development Goals (MDGs), with a particular focus on pushing women in science and technology. Considering the unique mandate over science in UNESCO, this institution also prepared reports on this subject seeking to advocate and reaffirm the importance of women in science and technology.

In 2003, the Report Women in Industrial Research: A Wake-up Call for European Industry (Rübsamen-Waigmann et al., 2003) was published by the High-Level Expert Group on Women in Industrial Research for Strategic Analysis of Specific Science and Technology Policy Issues (STRATA) which found the main barriers for women’s representation in STEAM in EU are biased hiring practices, women’s lack of confidence, lack of career opportunities for women; role models; gender stereotypes among other reasons. Reports and high-level meetings have continued since (EC, 2005; UNESCO, 2016).

These meetings and conferences set the agenda and have evolved since then, focusing on advocating for gender equality and including women in STEAM fields. Thanks to the integration of the gender mainstream approach (Pollack et al., 2000), the policies and programs created from this agenda turn into gender budgets, programs, and projects that are now implemented to boost women in these sectors. Therefore, understanding how these projects and programs have been executed is relevant—a topic covered in the second publication.

Within the STEM careers, Arts is often disregarded. However, this thesis has been included them throughout the four publications as these fields of study create intersections within knowledge where creativity, problem-solving, and innovation can be expressed.

Even though Science, Technology, Engineering, Mathematics, and more careers are considered rigid in the hierarchy of knowledge. Art is proven to be a relevant component, for instance, in “software engineering involving developments of Graphical User Interfaces (GIU), web designs [...]. Aspects necessary for software engineering where women can become excellent” (Halvorsen et al., 2019, p. 4). Creativity encourages unique ideas, taking appropriate risks, learning from mistakes, and envisioning in students (Craft et al., 2001; Runco, 2014), which in a hybrid knowledge approach can enhance innovative thinking in the STEAM curricula.

1.2. Objectives and Research Questions

Although there has been more than a decade of international research on women in STEAM, academics describe many reasons that intervene in women’s underrepresentation and leadership in STEAM. For instance, career path choices, validation and confidence in their knowledge, family encouragement, role models, the glass ceiling, the glass cliff and more. To our knowledge, no studies deal with analysing the scientific discourse, their framing process and media representations shaping the current knowledge paradigm over this subject. For this reason, the main objective of the thesis is to describe an exploratory analysis of social representations, media, and academic discourses about women in STEAM, considering Lithuania as a case of study in the European context.

To achieve the previous, the following specific objectives are proposed and are in line with the fourth publications displayed before:

To learn more about academic discourse women in STEAM, it is necessary to intentionally become familiar with basic facts of what the academic views are currently, as well as to create a mental picture of how these ideas, conjectures and hypotheses are, rarely looking for a unique truth (Neuman, 2007), but instead connecting patterns and paradigms to challenge. Hence, our first specific objective is to comprehensively review the existing academic discourse on the representation and leadership of women in STEAM and how scholars shape the knowledge from a gender perspective. This is achieved through an exploratory analysis of scientific discourse applying quantitative and qualitative methods that shed light on trends and contrasts.

“Individuals rely on authorities as a basis for knowledge” (Neuman, 2007, p. 3); consistently, authorities often spend considerable amounts of time learning and putting some effort into solving specific issues. European governments are no different. In recent years, they have acknowledged the scarcity of women in STEAM to match and meet market needs. As a result, the European Commission committed to leaving no one behind and released a budget for programs and projects in this line to help promote women in these fields. Thus, our second specific objective is to assess the European projects promoting women in STEAM fields by executing a systematic review that analyses EU-funded projects from 2019 until 2023.

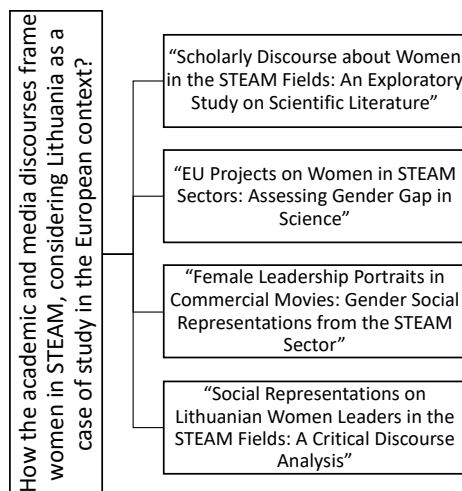
Role models are crucial in enabling women and young girls to see reflections of their capabilities, skills, and knowledge in admired peers. This influence, stemming from social and media depictions, significantly affects people's lives by presenting

portrayals of women scientists in mainstream films. The intricate interplay between concepts like social psychology, possible selves theory, mediation, social representations, and gender theories unveils the dynamics through which gender and power are woven into the fabric of cinematic characters. Therefore, our third objective is to analyse how commercial cinema portrays scientific women with leadership positions in these fields, using the Bechdel test and the Greimas Actantial Method adapted.

To this point, by revealing how knowledge is hierarchised and power dynamics are perpetuated within STEAM domain, a critical discourse analysis (CDA) is pertinent as it is an approach widely used in social sciences that studies the role of discourse in society, paying attention to the underlying strategies of dominance and resistance in social relationships of class, gender, ethnicity, sexual orientation, language, religion, age, nationality and more, reproducing dominance or inequality (Van Dijk, 1995, p. 18). For this reason, our fourth specific objective is to provide a critical discourse analysis on Lithuanian women’s leadership in these fields by conducting online questionnaires and in-depth interviews to gain insight into the challenges they face within these industries. It is worth noticing Lithuania is chosen as a case of study thanks to their early involvement in promoting gender equality initiatives since 1999, their leverage and mediatic movement to impulse women.

In Science, Technology, Engineering, Arts, and Mathematics (STEAM), the underrepresentation of women remains a pressing concern. This gender disparity is not solely a product of individual choices but rather a result of complex interplays between societal constructs, communication dynamics, and biased representations. The prevailing stereotypes surrounding women in STEAM are present in academic and media discourses, shaping perceptions and perpetuating biases. Thus, the research question is how the academic and media discourses frame women in STEAM, considering Lithuania as a case of study in the European context? Seeking to explore, describe and challenge the ideas contributing to persistent gender imbalances.

Figure 1. Graphical summary of the thesis structure.



Source: Author’s own elaboration.

2. STATE OF THE ART

2.1. Epistemological Surveillance and Scientific Discourse

As a response to challenge the hegemonic theories about power, social change and politics, critical studies emerged in education. Critical indicates a system of enquiries in which power works through discursive practice and academic performance (Popkewitz et al., 1997); it explains how people get marginalised and in which power forms, pertinent while studying gender dynamics in the STEAM field.

Additionally, epistemology provides a context to consider the rules and standards that organise the world views and the conceptions of “Self”; other definitions describe it as a knowledge theory concerning who can know what and under what circumstances. Additionally, a method is a technique for gathering and analysing information, and methodology is the argument about how these two are linked, demonstrating the impact of such research practice (Popkewitz et al., 1997; Chafetz, 2006; Harding et al., 1983).

The social epistemology situates the object of study as historical practices through which power relations can be understood. Therefore, epistemology is also an effort to understand the conditions in which knowledge is created (Popkewitz et al., 1997). Consequently, the academic discourse is a power result, for it is ordered through principles of classification that are collectively formed through innumerable past practices (Popkewitz et al., 1997).

For instance, in an academic context, learning means more than just the administration and assessment of a given knowledge; it also means interpreting such knowledge in which the reasoning and the self are psychologically dissected. Consequently, this self personifies how one should see or act towards the world, given constructed values, priorities, and dispositions. In short, epistemology and academic discourse together are how an approach contributes to understanding a specific phenomenon and under which scientific paradigm it was built.

Epistemology, when is focused on finding the truth by eliminating all possible subjectivities (epistemological positivism), becomes logical and mathematical grounded, this way denying the presence of the bodies and its claim for validity (Haraway, 1978; 1988). This is problematic as Haraway argues that through senses and bodies, humans access the world and, therefore, have an “embodied vision”, meaning knowledge is situated and partial. Furthermore, by applying the surveillance studies (Koskela, 2012; Ball et al., 2009) to STEAM with a critical and gender perspective, it is possible to compensate two or more different ways of looking at a phenomenon revealing how life experiences and selves are stitched together imperfectly.

Feminist theories hold a range of individuals, groups, reflections, and actions dedicated to ending women's subordination, inequality, and oppression within prevailing patriarchal structures. The ultimate goal is to attain emancipation, leading to a society free from sex or gender-based discrimination (Castells, 1996). These

theories are often categorised into two mainstreams based on political criteria, as outlined by Alison Jaggar (1983), and epistemological criteria, as proposed by Sandra Harding (1996).

For the purpose of this thesis, the focus is on science as a cultural practice that is localised/contextualised and socially constructed, meaning that there are many different sciences employed around the world (Longino, 1990; Harding, 1998). This approximation concerns a transformative paradigm (Mertens, 2012; 2019), one that can be informed by a number of theories and discourses (Critical, feminist, and race theories, among others). The main goal is the transformation, emancipation, and social justice of all individuals. Therefore, this paradigm combines historic and realist ontology, intersubjective and experiential epistemology, dialogic and dialectical methodology, quantitative and qualitative methods (Mertens, 2012, 2019; Longino, 1990).

2.2. Theory of Professional Ideologies in STEAM

Controversies concerning the essence, boundaries, and justifications of academic disciplines have existed since the inception of the disciplines themselves. Despite the various definitions and controversies that exist about ideologies, the concept, in a broad sense, is “any linked set of beliefs about social or political order, connected to and produced within a wide variety of social institutions” (Fine et al., 1993, p. 23). The term professional ideologies have been studied as how professional groups define their areas of monopoly, intellectual authority, access to opportunity and resources (Coburn et al., 1998, p. 21; Gieryn, 1983, p. 781).

Other authors have described professional ideologies theory as how academic disciplines are theorised in terms of their exercise of power in classifying, hierarchising, and preserving knowledge whilst ignoring others (Foucault, 1977). This idea comes from the educational design of curriculums; “curriculum is part of a discursive field through which the subjects of schooling are constructed as individuals to self-regulate, discipline, and reflect upon themselves as members of a community/society” (Popkewitz et al., 1997).

Throughout these definitions, it is explained that the appearance of social identity is directly linked to the reproduction of certain stereotypes in STEAM fields.

Social aspects of identity refer to a collective professional identity that guides professional behaviours and practices through professionalisation (Fagermoen, 1997; Niemi et al., 2007); thanks to the internalisation of such beliefs, values and behaviours through occupation, members of a given group have a specific behaviour (Abrams et al., 2004; Beddoe, 2013; Hogg et al., 1995). Hence, it is argued that this social affiliation is used to implement forms of control through a standardised identity (Jemielniak, 2008), that preserves dominant social groups (Tsouroufli et al., 2011; Wyatt et al., 2021).

For example, in medical professions, the top hierarchy is for the midwifery community, whereas nursing school is considered low in the hierarchy (Cornett et al.,

2023); “this hierarchy is based on seniority, further training, expanded practices, higher or different qualifications, type of work, place of work, among others” (Cornett et al., 2023, p. 605). From the economic perspective, the hierarchy is understood as how much one can make in certain industries, also categorising for example, humanities and arts as less attractive (Wahrenburg et al., 2007). Nevertheless, there are plenty of examples extended within STEAM careers mentioned in publication 4.

The interaction of social and professional identities is closely linked to the gender disparities within STEAM fields. As evidenced in the introduction, societal norms often dictate specific gender roles, leading to the division of fields based on gender and dominant groups. At the same time, it divides fields into rigid and creative ones, often disregarding that the world has changed, and in order to innovate, it is a must to combine disciplines and skills to discover new ways of doing.

For instance, a curriculum that combines a gender perspective knowledge in computer science and humanities can help to develop computational models that reduce bias in software operations. Therefore, this TPI serves as an instrument to produce and maintain issues such as the glass cliff, glass ceiling, and leaky pipeline, among others.

2.3. Gender Mainstream and European Projects

One major novelty of this thesis is the combination and exploration within disciplines on how the subject has been studied and developed within the programs and projects executed by the EC, which confronts real-world scenarios alongside theoretical perspectives.

Given that “the labour force will decline largely in all industrialised countries due to the ageing of societies and emerging globalised markets, the quality and quantity of workers in key industries as STEAM are critical” (Schlenker, 2015, p. 15). Accordingly, the development of curricula and the formation of professional ideologies play a significant role that has an impact not only on social dynamics but in the labour market. This influence extends to issues like occupational segregation and diverse gender inequalities within these sectors.

Moreover, the EC has been actively implementing the gender mainstream (GM) into all EU policies. This involves the adoption of gender-related topics by central actors who may lack interest or experience in gender but who work in policymaking (Pollack et al., 2000). Nevertheless, the efforts of supranational actors like the Equal Opportunities Unit of the Commission and the Women’s Rights Committee of the European Parliament have developed and expanded to leverage the gender agenda beyond the EU policies.

The GM formal definition dates from 1996, and it comes from the heart of the EC:

The systematic integration of the respective situations, priorities and needs of women and men in all policies and with a view to promoting equality between women and men, mobilising all general policies and measures specifically for the purpose of

achieving equality by actively and openly considering, at the planning stage, their effects on the respective situation of women and men in implementation, monitoring and evaluation of policies (Commission of the European Communities, 1996, p.2).

Implement the GM within the complexities, politics, and cultural differences that converge within EU regions is a challenge that demands the appointment of key officials, provision of training for officials, disaggregated data by sex, collection of statistics and more, to be able to plan, monitor and evaluate the effects of such policy on gender inequality (Nelen, 1997, p. 43-8; Rees, 1998) if executed.

The integration of equal opportunities into the Structural Funds is not only for reasons of social justice and democracy. The main aim of the Structural Funds is to reduce economic and social disparities and to establish the conditions which will ensure the long-term development of the regions- depending upon the fullest participation of the active population in economic and social life. Failure to overcome the constraints to equal and full participation of women and men [...] also means the investments made in human resources (e.g., in raising education and qualifications levels) are not exploited efficiently (Braithwaite, 1999, p.5).

The GM is an instrument to achieve real social change. The approach has evolved increasingly compared to the 90s, where most of the advisors and committee members, recipients of EU research grants, and commission officials were men. Despite the persistence of some challenges, the existing policies and efforts are transforming the discourse and leveraging the gender agenda.

2.4. Women's Social Representation and Role Congruency

“The education system is a major public asset, one of the largest industries in any modern economy, and one of the largest public undertakings” (Connell et al., 1993, p.11). In addition, education will become more and more important in the future thanks to organised knowledge that is the fuel of the current production system (Connell et al., 1993, p. 14). This shift in the economy is forcing every person to be driven by high productivity, skills formation, and the use of advanced technologies. Currently, almost any job is accredited. Therefore, encouraging or forcing professionalisation as a means to match the labour market, this way the education system and the market become gatekeepers for those at the top of the knowledge pyramid who possess all the power, knowledge, and benefits to remain dominant.

Women encounter a spectrum of challenges beginning in their early school years and persisting through university, specifically in the context of studying or pursuing careers in STEAM, as substantiated by the evidence provided in the introduction. Within this social framework, the power dynamics and distribution of resources act inside of social network schemes. The concept of social networks in this context extends beyond personal connections; they signify positional relationships that embody elements such as opportunities, inequalities, constraints, and growth.

Social representations are key to the complex comprehension of women's representation and leadership in STEAM, as they explain the values, shared beliefs,

and attitudes that drive behaviour and create meaning for a specific group of people. Although, it is through the lens of the congruency role theory that is possible to connect the social representations with the gender roles generated by society. This way, women's representation and leadership in STEAM responds to the influence of how society perceives them and constructs these roles, setting expectations and stereotypes about women's capabilities, attitudes, and abilities in these fields.

Accordingly, women navigate these challenges and opportunities by enacting their leadership as a performative act where they actively engage in the prescribed roles, carefully embodying what is expected of a professional in STEAM industries. Based on Butler's theory, the gender identity of women is constantly being shaped and constructed by the maintained repeated actions in alignment with the roles they play and the stereotypical behaviours from their professions.

A clear example of the previous is when "women downplay their interest in computer science because they are concerned about expressing an identity to others that is perceived as incompatible with their gender role" (Cheryan et al., 2020, p. 415). Or when a woman experiences sexism, "his comments got me angry: I think he thinks that he is more deserving of being here than I am. I feel like I am going to have to work twice as hard as he will to prove I belong here." (London et al., 2011, p. 521). Both examples demonstrate actions that are sometimes enacted unconsciously, sometimes consciously, but that are driven by feeling inadequate or not congruent in STEAM field contexts.

These concepts are intertwined, having a rather negative impact on many areas of women's lives, for instance, work-life conciliation, romantic relationships, access to a job opportunity, education, or resources to be an entrepreneur. Therefore, shaping the individual, their relationships, and the dynamics in it at all times, this explains the social belief that women tend to put their needs last (communitarian behaviours), while men are expected to be more individualistic (agentic behaviours are socially accepted). In a work environment, this last aspect can confront women and male leadership models, making one of them look more effective than the other.

The social cognitive theory that explores how humans learn through observation and experience comes into play as women observe and interpret the actions that are validated in STEAM as successful. These observations are filtered through social representations and mediations that permeate with all kinds of messages in the media, movies, press, etc., persuading who and when can access power. Finally, referring to the possible self's theory, the previous ideas also represent an opportunity for women to create different versions of themselves by changing values, beliefs, and ways of achieving what they consider success in these industries.

A last consideration, "the neo-liberal discourses that are dominant in today's society emphasise individualistic notions of choice and the over-simplification of it in the gendered career choices" (Beddoes et al., 2014, p. 1575), creating frictions in how women's participation and leadership in STEAM is understood, due to the following reasons:

- 1) The strategy of fostering an exceedingly responsible self while disregarding external constraints is a method employed to govern. In this approach, individuals

construct their life narratives as if they were the result of their deliberate choices aligned with their personal interests and aspirations. However, this portrayal masks the fact that people are, in fact, being influenced and governed by their own sense of freedom and ambitions rather than in opposition to them (Rose, 1990).

2) Within contexts characterised by uneven power dynamics and subordination, describing acquiescence rather than choice or consent is a more precise depiction. Consent is never granted in a completely free or impartial manner within situations of inequality. In circumstances that impose limitations, the concept of choice fails to consider the underlying conditions that influence people's decision-making. These conditions create a scenario where some individuals have more opportunities for choice while constraining them for others (Rose, 1990).

3. METHODOLOGY

3.1. Research Plan & Methods

This thesis has used a collection of techniques that are typical in “social research as a process for producing knowledge. This way, it is a more structured, organised, and systematic process than the alternatives that most of us use daily” (Neuman, 2007, p. 3), yet an effective one to interpret social research questions through scientific processes. While science happens at the core of a scientific community; this community practices science within a set of norms, behaviours and attitudes that bind them together and nurtures the system. This is called a paradigm.

Kuhn argues that “a sign of maturity in a discipline is recognisable when scientists operate with a paradigm” (Urry, 1973, p. 466); before this point, there is only gathering of facts and analysis. Yet, when one paradigm becomes dominant, there is normal and highly restricted science, as it invites select problems because they have a solution. Not as a result of mere interest. Therefore, in the “non-radical sociological paradigm, one should transcend the present situation where multiple pre-paradigms are confronting each other, and where work is done at all sorts of levels of significance, and with excessive methodological neurosis” (Urry, 1973, p. 463).

Aligned with this idea, the concept of scientific revolution emerges as Kuhn explains that “scholarly community forgets its commitments to paradigms when anomalies present to cause crisis, forcing them to abandon what was assumed as true and even, sometimes foundational to their discipline” (Anand et al., 2020, p. 1653). Based on the previous, women in STEAM have been analysed for over two decades. Yet, the structural problems persist, demonstrating that novelty research paradigms are necessary for the scientific community to shift the approach to this subject.

Reflecting on the subject with a gender perspective using the theories previously exposed in the state of the art in juxtaposition with professional ideologies, mediations, and congruency roles, it is possible to explore and describe the scientific contributions to the field of study. Therefore, using mixed methodologies allows gathering different types of data to look for patterns, advancements and contrast.

This thesis employs a time-series exploratory analysis with descriptive elements to gain a comprehensive and precise understanding of the subject. Exploratory to examine the area of knowledge, looking to formulate the right questions. Therefore, qualitative data tends to be used (Neuman, 2007, p.16). Complementary, there are descriptive nuances, “seeking to develop an idea about a social phenomenon and describe it” (Neuman, 2007, p. 16); in this type of research, it is common to use survey and content analysis, among others, procedures done in this thesis. It is worth mentioning that exploratory and descriptive research often overlap, and the findings may include percentages of people with specific views or behaviours.

Hereinafter, it is exposed to the specific methodology employed in each publication.

In publication 1, “Scholarly Discourse about Women in the STEAM Fields: An Exploratory Study on Scientific Literature”, to gather sufficient information to review the scholarly discourse about women in STEAM, an exploratory scientific content analysis was conducted. The navigation was done in EBSCO for social sciences and humanities extensive database, Academic Search Ultimate (EBSCO, 2023). The content revision considers from 2000 to 2020, as explained in the justification, like a change of century in which sensitiveness over the subject is at the centre of national and international agendas.

The content analysis allowed us to examine a body of scientific literature through a recorded system that includes counting and measuring patterns and trends. This information, often presented as numbers in tables and graphs, serves its purpose to discover features that otherwise will be undetectable (Neuman, 2007, p. 21). This type of analysis is used frequently in exploratory and descriptive research. Thus, it “is a scientific tool, a replicable technique that creates valid inferences from texts to the context of their use providing reliable findings” (Krippendorff, 2018, p. 24).

By making up a selection process via categories, through searches of complete texts, using keywords as descriptors, categories and subcategories of analysis, reviews, or journals, academic and peer-reviewed, as well as language filters, we reached a selection of articles that contain relevant information about the topic at hand. Additionally, the articles found that the “theoretical framework is understood as the discussion and reflections on the terms and concepts from the existing scientific discourse and the state of art regarding the main subject” (Rubira-García et al., 2020), creating almost a conversation in which patterns and trends arise over the scientific discourse.

The final output of 240 articles passed through a meticulous assessment done by member validation board, as a third party designated to be impartial and who abiding by ethical protocols could refine the sample unit. These experts and practitioners’ groups were individuals not related (nor family or friends) to any of the researchers, and their purpose was to supervise the sample unit seeking those articles that create value in the field of reference. This decision is made appealing to demonstrate transparency and trustworthiness in the process of refinement (Neuman, 2007, p. 369) of this sample.

Once the selection process was done, the final sample is 46 curated articles. The codification and analysis of the data are recorded on a spreadsheet outlining the information in interaction with the categories and subcategories identified. For instance, one category responds to the main features of scholarly literature on women in STEAM, and the subcategories identified are review title, the period of publications, collaborations between universities, countries and gender, authorships, and correspondence, to mention a few. With this approach, we drew interpretations on the data processed, such as patterns of collaborations between universities or main fields of interest within STEAM and Women as descriptors.

As described in the state of the art, the production, categorisation and shaping of knowledge can be to the use and service of the dominant groups in society, making it relevant for this exploratory research to create a connection with the concepts of social structure and epistemological surveillance. This epistemological surveillance is

necessary as it helps us researchers validate the consistency in data analysis, choices and theories used in relation to the study proposal (Bourdieu et al., 1991). Hence, the social structure in A. R. Radcliffe-Brown's explanation is "1) to make a systematic classification; 2) to understand particular features of systems, by revealing the particular feature as a part of an organised whole and by showing that it is a special example of a recognisable class of phenomena; 3) to arrive at a valid generalisation about the nature of human societies" (1941, p.17).

Social structure is not a field *per se*. However, a method applied in any social studies that refers "to a group of problems the scope of which appears so wide, and definition so imprecise that is hardly possible for a paper strictly limited in size to meet them fully" (Moore et al., 2014, pp. 78-79), yet when it comes to discussing social issues as the gender disparities in STEAM, the analysis of the social structure provides an understanding on the power relations and the roots of such inequalities, that interplay between the subject of study and other actors.

In publication 2, "European projects on women in STEAM sectors: assessing gender gap in science". A systematic literature review was initially undertaken to assess the outputs and achievements of European Union-funded projects spanning from 2019 to 2023 onwards. The primary objective was to comprehensively question if there was previous research with the same focus concerning mapping projects or project reviews in the line of women's promotion in Science, Technology, Engineering, Arts, and Mathematics (STEAM).

A systematic literature review (SLR) is essential to academic research. Fundamentally, knowledge must be built on previous existing work (Xiao et al., 2019), and by revising the results in deepness and scope of the existing literature, one can identify the gaps to explore. The main characteristics of a SLR are that they should be valid, reliable, and repeatable. However, SLR serves two primary purposes: 1) Background reviews are used as justification for decisions made in the research design and identify the gap that the study intends to fill, and 2) Stand-alone reviews attempt to make sense of existing literature through aggregation, interpretation, explanation, or integration of existing research (Templier et al., 2015; Levy et al., 2006). In this thesis, our SLR serves the first purpose.

The SLR can be conducted in a significant number of databases. Nevertheless, "there is not an established methodology that allows carrying out a systematic analysis of the studies and progress made through research projects in a specific area or topic" (García-Holgado et al., 2020B, p. 137), even though it is possible to locate literature related to projects, they might not be fully systematised. However, initially, we did an SLR looking to find previous studies related to this topic in databases such as Web of Science (WoS) and search engines such as Google and Google Scholar, using the keywords: Gender gap; women OR woman; mapping study; Systematic Literature Review; European projects; STEM OR STEAM, some of the relevant results are in Table 1.

The keyword "mapping studies" is included as they tend to provide a comprehensive overview of the field and identify points where more primary studies are needed (Kitchenham et al., 2011). Overall, the purpose was to map the literature

that connected STEAM systematically, Gender; Women/Woman and European projects from 2019 to 2023 or onwards.

Table 1. SLR results on mapping studies/projects related to promoting women in STEAM.

Author	Article title	Year	Topic area	Article type
Verdugo-Castro, S.; García-Holgado, A.; Sánchez-Gómez, M. C.	<i>A systematic literature review on gender gap in higher STEM studies</i>	2022	Higher STEM studies	SLR
EIGE	<i>Economic benefits of gender equality in the EU</i>	2017	STEM education	Report
Valdés, G.; Thomason, B.; Bentacor, A.; Jeria, I.; Troncoso, C.	<i>A mapping study on technology, gender, and organizations on tech companies</i>	2022	Tech, gender, and organizations	Systematic Mapping Study
Poggesi, S.; Mari, M.; Foss, L.	<i>Women entrepreneurship in STEM fields: literature review and future research avenues</i>	2021	Entrepreneurship in STEM disciplines	SLR
Bishu, S.; Alkadry, M.;	<i>A Systematic Review of the Gender Pay Gap and Factors That Predict It</i>	2016	Gender Pay Gap in the workforce	SLR
Silander, C.; Haake, U.; Lindberg, L.; Riis, U.	<i>A Nordic review on gender equality in academic careers: a literature review</i>	2021	Gender equality in academic careers	SLR
Wiken-Wilson, A. and Patón-Romero, D.	<i>A mapping study on gender equality in tech entrepreneurship</i>	2022	Tech entrepreneurship	Systematic Mapping Study
Tomassini, C.	<i>A review on gender gap in science and the research agenda</i>	2021	Science and research agenda	Systematic Review

Source: Author's own elaboration.

Some of the results depicted in the previous table describe similar interest in the subject of our study, still, they move within the gender spectrum and STEAM fields. Only three studies represented a starting point for this research. Results listed are European Proposals to Work in the Gender Gap in STEM: A Systematic Analysis (García-Holgado et al., 2020A); and Guidelines for Performing Systematic Research Project Reviews (SRPR) (García-Holgado et al., 2020B); and Trends in studies developed in Europe focused on the gender gap in STEM (García-Holgado et al., 2019). It should be noted that after conducting the SLR, the SRPR is the methodology used in the analysis of this publication.

About the SRPR, this methodology does not pretend to modify the SLR or the mapping studies protocols. Nonetheless, it proposes a solution to analysing a set of projects, following a specific criterion based on data collection and critically studying multiple studies through a systematic process. Thanks to this technique it is possible to filter within larger project databases in Europe (Kitchenham et al., 2009; Petersen et al., 2008; Petersen et al., 2015). Regarding the period of time, we intended to update and amplify the previous study (García-Holgado et al., 2019), seeking patterns and

trends and contrasting the information found. Although this SRPR starts from where the previous study ended in 2019, it does not stop in 2023, as there are projects signed within the periods mentioned that will end in 2025 or more. For those projects, we analysed partial results or reports.

In publication 3, “Female Leadership Portraits in Commercial Movies: Gender Social Representations from the STEAM Sector”, to achieve the aims of this research, several techniques were used. First of all, the Bechdel test. A methodology born on “The Rule”, “a comic strip created in 1985 by Alison Bechdel in which the female character creates the following rules: It has to contain at least two women in it who talk to each other about something besides a man” (García et al., 2014, p.131). As it seemed a reasonable request, it served as an inspiration to critically study women in fiction. Since then, it has been called the Bechdel test, and it is commonly applied in mass media studies, including cinema.

In case the answer is "yes" to all the previous questions, the film has passed the test" (Agarwal et al., 2015, p. 830), which means there is female representation. Accordingly, it helps to detect male preconceptions if the answer is no (Scheiner-Fisher et al., 2012). This method has been applied to measure the presence of women in conversations held on social media platforms (García et al., 2014). As the test does not fully reflect all the inequalities in movies and media (Hickey et al., 2017; O'Meara, 2016), consequently, a second approach was involved in expanding the perspective: the Greimas Actantial Method adapted.

Some of this test's limitations are that it does not acknowledge the gender intersection: age, race, ethnicity and more; female portraits that are currently also in the fight for representation at all levels. This is relevant to the results of this publication, and it discusses the depictions made of women of colour and elderly women, who are almost invisible in the portraits studied. Albeit this is changing now.

The Greimas Actantial Method claims that every narrative is divided into six basic elements that are: 1) the Subject, the element that takes action to achieve the goal; 2) the object or element, is the goal sought by the subject; 3) the sender: element that motivates the subject into action; 4) receiver: obtains the benefit from the subject's achievement; 5) helper; 6) the opponent, are both elements that assist or obstruct the subject from reaching the goal (Chandler, 2002; Hébert, 2011). However, interactions are supervised through a diagram visualisation where axis are desire, power, and communication, providing information on every character's relevance.

Additionally, part of the method is the analysis on the narrative trajectory. In a few words, a narrative trajectory in the film begins with a problem to be solved, in which performers act, and as a result, the initial problem is either solved or not. Consequently, the theory develops in a trajectory or phases in which the individual/hero who executes the action solves the problem, and in the midst of this, a discourse unfolds that leads to performative activities. Nonetheless, this narrative trajectory can develop in a specific way depending on the actions and their reactions to conflicts. There are three tests to evaluate the narrative, which are 1) a qualifying test regarding competence, 2) the decisive test concerning the use of resources as a

means to solve the issue, 3) a glorifying test, where there is a resolution to the initial problem” (Saraswati, 2022, p. 315).

Regarding the sample, in the scouting for previous research that assessed women’s scientific representation in the cinema, from any STEAM field, in the period of 2000 to 2022. Results were vague as these studies covered other related topics, but they did not involve STEAM areas. From this search, only one study stands out but was outdated: “Cultural Representations of Gender and STEM: Portrayals of Female STEM Characters in Popular Films 2002-2014” (Steinke et al., 2017). Consequently, this study was used as a baseline and conducted the search technique to amplify the initial sample up to the year 2022. As explained in the research, film databases used are IMDB, Rotten Tomatoes and Google Search from 2014 to 2022. A total of 60 films came up after filtering to eliminate series, documentaries, and other types of programs. The final sample is 52.

All the movies were watched in order to refine the results. It is worth noting that while diagrams are used in Greimas' actantial method to explain the semiotics system of meanings (Chandler, 2002), for the purpose of this study, an adaptation has been implemented using an Excel matrix. This adaptation allowed for the convenient evaluation of relationships between characters. The results derived from the sample obtained after applying filters and Bechdel questions constitute a representative selection of 4 out of 7 movies for the application of the adapted Greimas actantial method.

The Greimas Actantial Method and the Bechdel Test complement each other effectively in understanding portrayals of female scientists in commercial cinema. The Greimas Actantial Method provides a structured framework to analyse narrative roles and relationships, allowing for a comprehensive examination of how female scientists interact with other characters and contribute to the plot's progression. On the other hand, the Bechdel Test focuses on gender representation by evaluating whether two named female characters engage in a conversation about something other than a male character. Combining these approaches offers a holistic perspective that informs on the complexity of female scientists' roles, interpersonal dynamics, and gender-related biases within cinematic narratives.

Apart from Greimas Actantial Method and Bechdel test, the connection with theory of mediation is also significant. Primarily due to these methods and theories to be employed together in the analysis of texts or images with the main aim of uncovering the underlying gender inequalities structures. In essence, the intersection with mediations allows the exploration of narratives and images in a paradigmatic level (Barbero, 2002).

In publication 4, “Social Representation on Lithuanian Women Leaders in the STEAM Fields: A Critical Discourse Analysis”, the Lithuanian Case study involves an in-depth analysis of Women leaders in the STEAM industry, using quantitative and qualitative data to find patterns, similarities, and contrast information. The methods applied are online questionnaires and in depth-interviews under the Critical Discourse Analysis (CDA) approach.

The process of selecting Women leaders in STEAM in Lithuania was supported by the third author in this research from Siauliai Valstybine Kolegija, who contributed to the localisation and contact of these women. The main criteria were women with a STEAM background, in the position of leadership at any organisation; or a successful recognised entrepreneur in the sector; or recognised researcher in the field; or with a political position which involves the STEAM sector (transport, communications, and so on). Accordingly, we navigated the internet looking for press and media data and international prizes for women in STEAM such as L'Oréal Women for Science. A final list of 18 women was contacted back in 2021 through the Lithuanian University, LinkedIn, among others.

The final sample unit was 8 informants who accepted to participate in the research. Consequently, an online questionnaire was sent to their emails to gather initial information and schedule an in-person meeting to conduct the 1-1 interview. At times for the interviews was necessary the participation of the third party, as these women felt more comfortable saying some expressions in their mother tongue. Nevertheless, most of the material was in English (questionnaires and interviews). For this process, an ethical and trust protocol is informed at the beginning of all and also reinstated via email. As a result, for the purpose of this study, confidentiality is primary, and any recording or key information that can reveal identity is not or will ever be provided.

As in previous publications, the use of qualitative and quantitative methods for collecting data provides a broader opportunity to comprehend social sciences issues, as after conducting an online questionnaire, an interview to develop specific points can be very useful (Creswell, 2003). The questionnaire and interviews were planned, conceptualised, and operationalised (Neuman, 2007, p. 168) regarding the main categories of this study, which are Professional ideologies, leadership, role congruency, and social representation in connection with gender perspectives. Regarding the questionnaire, the informants were asked simple factual questions, some of them open-ended, some close-ended; in any case, "questions were simple, clear and keeping the best interest of our informants at hand" (any sensitive questions) (Neuman, 2007, p. 170). This helped to avoid ambiguity and vagueness.

The decision on which questions to ask, open or close-ended, is based on the information needed to understand the main issue. Therefore, in the email where the questionnaire was shared, precise information was given in terms of the times, type of questions and more, for informants to set a specific time to respond. Additionally, "to minimise confusion, the questionnaire had an intentional sequence" (Neuman, 2007, p. 182). Information was then classified and coded on an Excel matrix by informant and categories of analysis.

For the semi-structured interviews, face-to-face encounters between the researcher and the interviewee were planned in a safe environment. These meetings aimed to understand the perspectives that interviewees have regarding the categories asked, and it followed a model of conversation as a formal exchange of questions and answers ordered by category. This process was intended to be somehow flexible in order to allow emerging topics to come up naturally. Therefore, even though there is a research instrument, the interviewer guides which questions to ask and how (Taylor et al., 1897). These interviews were recorded and lasted approximately 45 minutes

each, and they were also coded by informant and category of analysis using their reported speech.

An analysis of the CDA allowed to understand the discourse components and/or consequences of power abuse by dominant elites (in this case, related to STEAM professional career) and institutions. Additionally, it reveals how, through different mechanisms, certain groups impose themselves in solidarity with the dominant ones (Van Dijk, 1995, p. 24). This theory, in juxtaposition with the theory of social representations (TSR) and role congruency (TRC) explained in the State of Arts, creates a triangulation to understand further about power dynamics that suppressed or impulse these Lithuanian women to achieve leadership in STEAM professions.

Lastly, Lithuanian women are selected as a case of study considering the previous results found in publication one, where the comprehensive data showed the distinctive socio-cultural and educational landscape in Lithuania, the unique initiatives pursued in the European context; the facts previously mentioned 1) First European country with a former Prime Minister; 2) EIGE creation; and 3) sustained good results over periods in the Gender Equality Report. Furthermore, the selection is also driven by the desire to explore a less common context, showcasing the potential for women's leadership in STEAM in countries beyond the traditional recognised within the European framework.

3.2. Incardination of Publications

The first phase of developing this thesis involved an examination of the current state of the art in the field, background studies, objectives, materials selection, research methods, and the formulation of a detailed work plan. This plan included a timeline outlining the research process. Although there was a research plan, the publications passed final revisions at different times. Therefore, the logical organisation has been done in this text with the intention of explaining the true core of this research and, so, its coherence.

The primary objective of this exploratory analysis is to conduct an extensive review of the existing academic discourse concerning the representation and leadership of women in STEAM (Science, Technology, Engineering, Arts, and Mathematics) fields. This analysis seeks to understand how scholars are shaping the knowledge in this domain. Therefore, for the first publication, the approach is centred on understanding various aspects, such as scientific collaborations between nations, institutions, and researchers within the field. Also, it reveals trends and disparities regarding author collaborations, topics analysed, and types of research interventions conducted.

Considering that European countries have recognised the underrepresentation of women in STEAM and have acknowledged the need to align their workforce with market demands. This commitment made by the European Commission materialised in the allocation of budgets for programs and projects aiming to promote women in STEAM sectors. Therefore, through a systematic review of projects funded by the EU from 2019 to 2023 and beyond, we aimed to uncover the main trends, challenges, and

advancements achieved in promoting women in these fields by European countries. This effort is as significant as the previous one. Nevertheless, it is more focused on implementing strategies in the practical field rather than just research in this area of analysis. Results are mixed since projects do not manage a sole source or type of data obtained. Nevertheless, most projects demonstrate that the execution of gender mainstream strategies at the macro level of politics in EU countries is essential and effective.

To this point, the exploration has been focused on academic discourse and the analysis of EU projects. However, understanding more about social representations is key to examining the role of cinema in the dissemination of symbols and narratives that shape public perception, a power that can not be underestimated. This impact extends to individuals' lives by portraying women scientists in commercial cinema. By drawing connections between social psychology, the possible selves theory, mediation, social representations, and gender theories, the third publication creates an interconnection that explores the power dynamics related to gender in characters displayed on the big screen. This confirms that cinema, as any other media, has the power to perpetuate or change social narratives around women in Science.

Lastly, the thesis finishes with the fourth publication that centres the attention on the critical discourse analysis of Lithuanian women leaders in STEAM sectors. Lithuania, as explained before, has been chosen as a case of study considering its involvement in promoting gender equality initiatives since 1999, creating leverage and mediatic movement to impulse women in different areas, including STEAM.

The critical discourse analysis delved into various categories of analysis, including social representations, professional ideologies, gender identity, mediations, and role congruency. The main aim is to complete a holistic picture of how the subject of women in STEAM is understood from different angles, this time considering the informants' own experiences. These results shed light on how professional and gender stereotypes permeate the system but also highlight the boundaries that these successful women have overcome. Furthermore, this last publication served as an inspiration for other women by showcasing how role models play a crucial role in inspiring women and young girls, allowing them to relate and aspire to achieve similar heights in terms of skills, abilities, and knowledge.

4. GLOBAL RESULTS

The global results and discussion have been coded using the same categories as in the objectives and in coherence with the chapters of this exploratory analysis of social representations, academic and media discourses of women in STEAM: Lithuania as a case study in the European context.

In the first publication, the distribution of research that analysed women in STEAM reveals that 30% occurred between 2008 and 2015, and a substantial increase to 70% from 2016 to 2020. Additionally, collaboration rates are around 39%, with a concentration of articles from U.S. institutions illustrating strategic alliances within the country. Gender imbalances in authorship are evident, with 74% of research papers written by women informing about the lack of male participation in research, which can perpetuate inequalities. While STEAM topics like research collaboration, inequalities, career pathways, and more are analysed, there is a need for a multidisciplinary and intersectional approach that considers the ARTS field and that incorporates the views and experiences of diverse women in these sectors.

Academic research predominantly employs programmed and documental methods, focusing on private and public agendas and involving both offline and online research scenarios. The contributions of academia to the study of women's representation in STEAM are significant. Some of it is about gender inequality extent, factors influencing women's interest in STEAM careers, career challenges and opportunities, and the impact of motherhood on work-life balance. However, the emphasis leans towards descriptive research rather than research-action participation, which could foster broader social change for women's leadership and participation in these fields.

Results indicate a shift in publication patterns, collaboration rates, highlight gender imbalances in authorship, and point to both strengths and gaps in research academic focus and methodologies. Scientific contributions are valuable, yet the potential for a more diverse range of research approaches and a more comprehensive consideration of intersectionality emerge as an area for further exploration and advancement in the study of women in STEAM.

Considering the second publication, the study of several projects reveals distinct focuses and strategies for promoting women's participation in STEAM fields. CORDIS projects primarily emphasise learning experiences, often incorporating activities tied to career fairs, while also developing Gender Equality Plans (GEP) to foster inclusivity in STEAM organisations. ERASMUS projects, on the other hand, centre around STEAM education, particularly working with schools to inspire young girls' interest in these career paths. While KEEP's projects cover a spectrum of themes related to women's and young girls' engagement in STEAM that take place not only inside European regions.

Project structures are diverse, which is very enriching and, nevertheless, hard to measure. At least 37% of projects adopted a mixed approach combining assessment and activity development, yet very few used some diagnosis tools. A majority (63%) were identified as interventions aiming to evaluate or create tools for

measuring impact. Most projects provided a wide range of outputs, including good practices, educational materials, assessment frameworks, online platforms, policy recommendations, and more. Although availability and access of information was an important limitation, while CORDIS records were accessible, ERASMUS+ and KEEP databases were less open, potentially restricting the scalability of these projects.

The temporal distribution revealed that 18 projects were funded from 2017-2019 and 12 from 2020-2021, predominantly ongoing, contributing to a total EU Commission investment of €57,985,618.69 across European countries and sometimes outside regions. These initiatives often were led most of the time in partnerships across institutions, academia, governmental ministries, research organisations, and companies, collectively aiming to encourage and facilitate women's participation and leadership in the STEAM industries.

As mentioned before, some projects were led by Spanish institutions (academia in most cases) most of the time and referring to the outside regions, these interventions took place in Jordan, Tunisia, Palestine, and Israel, demonstrating a global scope and interest in women's agenda.

In the third publication, the study of women's portrayal in films indicates a shifting landscape within the film industry, as efforts to depict minorities, social issues, and inequalities have increased across various genres. Analysis of the Bechdel test results suggests varying levels of female representation and interactions within movies. Among the 52 movies studied, genres such as action, drama, and sci-fi are prevalent. After applying the Bechdel test, a mere 11% passed these criteria for female interaction. However, it is important to note that passing the test does not always translate to meaningful or non-stereotypical representations of women.

Society is influenced by films, and this is acknowledged through the power they hold on to shaping people's perspectives. Market trends and budget considerations tend to dictate filmmakers' choices, leading to the portrayal of characters that align with consumer inclinations, often reflected in the ticket box phenomenon. Nevertheless, this influence is complex, as films can both reinforce stereotypes and have the potential to challenge and alter societal norms.

Since the Bechdel test alone is not enough, the Greimas Actantial Method adapted is used upon a representative sample of the movies that passed the first test. The Actantial method adapted delves into women's portraits in STEAM-related careers in commercial cinema, highlighting the power, resistance and collaboration dynamics between characters in the narrative sequences. Results indicate that men often hold central positions, shaping the outcomes and resolving conflict for which the plot has developed, while women's roles frequently revolve around maternal or communitarian instincts.

Whilst studying the interpretation of these commercial film portrayals in connection with psychological, gender and social representation theories, the analysis accentuates the relevance of the intersectional approach, revealing how women's struggles are often tied to privileged male power and that can be expressed or enacted in different ways depending on ethnicities, religion, nationalities, and more.

Among the movies studied, biographical films provide insight into the lives of scientific women, also portraits of Eastern women who were both scientists and inventors. Yet, the world does not remember these movies due to the movie popularity being based on films with big budgets. Movies such as *Hedy Lamarr* (Alexandra Dean, 2017), a woman whose inventions were stepping stones that led to the creation of WIFI and Bluetooth, are not as popular nor recognised as male-driven blockbusters like *Oppenheimer* (Christopher Nolan, 2023), or *Top Gun Maverick* (Joseph Kosinski, 2022), independently of their release year.

Overall, the study highlights the complex relationship between film, societal perceptions, power dynamics, and symbolic-social representation, emphasising the importance of analysis to truly understand the impact of media on shaping beliefs and behaviours about women in STEAM. A final noteworthy result to mention is that the Greimas Method is used to compare films from the same genre, and while assessing dystopian or sci-fi films, the study showcases how symbolic systems resonate with human-like social organisation, fostering an emotional connection with the audiences, which can be used to replicating or challenge stereotypes by re-signifying under symbols and meanings.

In the fourth publication, the study engaged women informants in their 30s to 50s who were born in Lithuania during or after the Soviet Union era. These women are accomplished and recognised leaders in various STEAM fields, some of them with skills and additional humanities studies. They hold positions of power where they work that range from industries such as technology, construction, mathematics, neuroscience, urban and transport design and more. These women possess advanced degrees and manage resources, teams, and projects in both public and private STEAM-related sectors.

The informants described in the questionnaire and interviews experiences of breaking gender norms in STEAM; for example, one informant expressed that she “surprised” her colleagues in a meeting, as they were expecting the CEO of a steel construction company would be a man, and it was her. Informing about how industries take up to the professional ideologies paradigm and process it as the norm, it is normal to see a man directing a STEAM company, but not someone “too” young and a woman.

The study revealed several patterns to summarise the relevant ones: informants strive for excellence and crave control; they are, in most situations, driven by a critical mindset and meticulous planning to achieve outcomes, exhibiting high levels of self-efficacy, constant ambition for achieving great goals, and a sense of responsibility. Nevertheless, these women also expressed concern that their team should grow as much as they grow, improving everyone’s quality of life, which describes a transformative leadership style within their STEAM professions.

It is also worth noticing that family plays a crucial role in their journeys; supportive parenting styles inspire them to pursue their ambitions and overcome challenges. Positive influences from parents, teachers, and mentors stimulated them to enter STEAM. Despite the stereotype that technical knowledge is a key barrier, these women stressed that for them, success in these industries requires both technical skills and a high level of competence, confirming the importance of knowledge and efficacy validation was necessary to build their confidence.

Informants navigate the STEAM landscape with a tournament mindset, embracing perfectionism and striving to exceed their own expectations. Additionally, when they were asked about the necessity to achieve high goals, they mentioned they aspire to succeed not just for personal achievement but to uplift others around them, demonstrating a commitment to fostering growth around them.

In essence, the study showcases women leaders who defy gender norms and strive for excellence in STEAM fields every day. Despite the gender norms within these fields they work, they choose which battles to fight and which battles to use in their favour to achieve even higher. Their education, internal drive, and commitment to inspire others have boosted them to break barriers with resilience, redefining leadership in industries traditionally dominated by men in Lithuania.

5. DISCUSSION & CONCLUSIONS

In the context of the Covid-19 pandemic, the interest in promoting and encouraging Women in STEAM increased significantly not only in European countries but in the world. Yet, focusing on the results obtained, the most used databases record a relevant amount of research from American institutions rather than Europeans. Considering this, scientific collaborations seem to be stronger between Universities within the U.S. more than in European countries. Although, after studying the SRPR on EU projects, an important body of research came up, it is not published in the main international research databases.

Additionally, it is not surprising that most of the research on this subject is being conducted by women, although authorship and collaboration in authorships can encourage scientific collaborations between countries and institutions, bringing new perspectives to the scientific discourse on the intersectionality issues that are lacking. At the same time, it is imperative to involve the participation of male collaborators in the study of Women in STEAM as a means to break barriers and co-create new realities as equals.

The academic discourse is centred on many issues within the spectrum of Women in STEAM. For example, participation in the STEAM industry, STEAM education, research, computer science, and even entrepreneurship, among others. Although, if contrasted the American research insight with European research outputs from SRPR projects, European countries appear to be conducting research on this ground to endorse the necessity of such projects, and the focus is centre on the areas of interventions and applicability, audits, creation of tools to measure impact for Research Performance Organizations (RPO), Research Funding Organizations (RFO), and the creation of Gender Equality Plans (GEP).

Developing further, the SRPR on women's social representation and leadership in STEAM responds to the calls released by the EC, meaning that the research agenda and academic discourse are moved as a resource for innovation and development by this supranational agenda. Accordingly, the projects and research abide by what is on trend to gain participation in such international projects. This does not represent a negative aspect. Nevertheless, the trend must be consistent in time to achieve full equal rights and opportunities on the feminist agenda.

The academic discourse used in some projects done by European universities or RPO, RFO Institutions, showed at times a lack of clarity in how objectives are expressed and expected outcomes were to be measured, for instance, how it is possible to measure women empowerment in the STEAM field? It is definitively not impossible, yet not as convenient as the objective to measure. In addition, there needed to be more plans and alternative funding to continue the projects, which affected the consistency of the results over time. Consistency is critical for social change, as any society manifests quick changes within 2-3 years.

Furthermore, it is noticeable that the academic system and its knowledge discourse are situated on the trends and agendas set by governments and available resources. Moreover, this seems more reactive than preventive to tackle real-life issues.

Inherent to the hierarchy of knowledge is its intricate link with professions, career trajectories, labour markets, and the socioeconomic status of societies. An evident trend emerged connecting results in publications 1 and 2; despite the context (U.S. or Europe), the academic discourse is consistent in the exploration of STEAM in juxtaposition with gender within the following frameworks: 1) corroborating gender inequalities in STEAM, 2) addressing challenges and opportunities for women in research career path, 3) understanding and try to tackle challenges for women in career development in STEAM, 4) cognitive differences and biological differences between men and women, 5) work-life balance, priorities, and co-responsibility.

From a more holistic perspective, the scientific discourse in the SRPR analysis is divided into STEAM education, career paths and job seeking, including retention and attraction of talent, and skills formation. Although understanding science as a cultural practice that is socially situated and that is attached imperfectly to real-life views, the research trends start to become repetitive on the problems rather than finding solutions. This way, only one result from the EU SRPR represented an innovation -EQUAL4EUROPE, a project that implemented a combination of techniques, disciplines and knowledge that involved arts, humanities, medicine, social science, business and law (moving away from the STEM), allowing to disrupt the rigid knowledge and power paradigm of these fields.

Through these interconnected frameworks, the academic discourse delved into multifaceted aspects of women's participation and experiences within the STEAM domain. The discourse not only acknowledged gender disparities but also aimed to dissect the underlying complexities of its roots. For instance, for the EU project execution, the main audiences involved were young girls and adolescents attending to the finding that refers to family and schools' encouragement is important to stop the leaky pipeline in these areas. Consistently, the outcomes of most projects were online forums and networks, MOOCs, training, toolkits, educational material, and good practices, among others.

Although this is not the only reason for women's lack of representation and participation in STEAM, role models are a factor widely studied that contributes to inspiring and encouraging young girls and women. The female social representation analysed through the portraits and the interviews in publications 3 and 4 suggests that the most recurrent careers were Biologists, computer science, engineering, neuroscience, mathematics, communications, technology, transport, construction, and urbanism. It is worth noticing that in films, portrait ageism is as present as in real-life impressions of the interviews done.

In the films, the majority of women scientists were white/Caucasian females in their 20s or 30s, often portrayed with a neglected physical appearance. They were depicted as solitary and obsessed with their jobs to the point of not having friends or family. On the contrary, as mentioned earlier in the interviews, age is sometimes perceived as a lack of knowledge and experience to lead a team in a STEAM environment. These extreme portrayals fail to capture the complexities of real life fully. However, the prevalence of young portrayals in films might also be influenced by the industry's bias towards youth. In any case, men do not seem to suffer the same consequences.

The gender stereotypes are present in STEAM careers due to the professional ideologies, and they are normalized through the constant practice and culture association that reinforces this as a particularity within organizations and groups of people. For instance, the competitive paradigm that underlies the overachieving mindset displays an interiorized idea -to prove oneself constantly by doing more than what's expected, in order to feel worthy. Such characteristics are present in most human beings, nevertheless, only women suffer from proving themselves constantly to society's expectations. Without falling in oversimplifications, these traits are taught and absorbed through education, family narratives and media influence that in the end, allow some forms of control to act within their acquiescence³.

Considering that in the knowledge society it is almost obligatory to have certifications in order to be able to access opportunities, reality also shows that skills formation allows finding nontraditional career paths. While, women are not underrepresented in all STEAM fields, nor have access to leadership positions, throughout the academic discourse the revision on the power dynamics is positioned on the patriarchal oppression that women experience, without considering the notion of professional ideology and curriculum constructions and the role of this concept in connection with social justice and the feminist agenda.

This way the scientific paradigm has done great improvements and discoveries to uncover power dynamics and oppression to women due to the patriarchal system that permeates STEAM fields. Nevertheless, it is worth trying to explore new multidisciplinary and epistemological approaches that contribute to challenge the knowledge pyramid and that bring innovative perspectives that reveal how life experiences and people are a result of their multiple imperfect interactions.

Academic and media discourse effectively align with prevailing societal trends and issues. However, tackling the profound challenges of gender representation demands more than descriptive research. Addressing the sophisticated web of social representation means attending to the sociocultural accumulated aspects that impact women's motivations and abilities within STEAM fields, requiring a multidimensional intervention aimed at generating viable solutions.

Moreover, power dynamics are a pervasive aspect of human existence, influencing and being influenced by both internal and external factors. Within this context, knowledge emerges as a potent instrument employed to maintain the advantages of dominant groups within industries, acting through education and the professions. To catalyse change, it becomes imperative to employ intersectionality, a lens that illuminates the factors that need to change in the system.

In conclusion, the imperative of unlocking and reshaping instrumental relationships remains crucial to initiate profound and impactful transformation. However, even within this process, the perpetuation of acquiescence is likely to persist. The evolution of gender theories and social discourses have evolved, reinforcing the idea of individualism as a rule. Also, it is an intrinsic facet of human nature to believe that individual decisions are self-governed, and this way, there is

³ Acquiescence is a more accurate concept to refer to the "freedom of choice" in contexts where the main characteristic is uneven power dynamics, as circumstances impose limitation that somehow influence people's decision making.

empowerment, the dominion of oneself and the choices, often unaware of the invisible forces that shape such choices.

This illusion in the perception of freedom is, in reality, a way to create new chains between individuals using their own ambitions as fuel. In this context, it's important for women to maintain their sense of agency, be resilient, and rise above the gender norms imposed in STEAM fields. This empowerment is crucial for reshaping the narrative and working towards a more inclusive and fair future.

6. LIMITATIONS AND FUTURE RECOMMENDATIONS

In the first publication, academics tend to use descriptive research instead of research-action-participation applied to different contexts to encourage social change, and this is considered as a limitation as more intervention can contrast real life with theory, bringing new solutions to today's women in STEAM problems. Additionally, for those who design projects, a diagnosis should be, in most cases, necessary when planning for research-action interventions to be able to measure the overall impact of the project.

Considering the second publication, a limitation found while conducting the SRPR is that only CORDIS database in Europe has open access to project files. Erasmus + and Keep unavailability potentially limits scalability for future research with these same methods.

On the other hand, a recommendation when analysing films is that the Bechdel test cannot be taken as the only tool, for it fails to reveal hidden gender disparities. For example, in *Arrival* (Denis Villeneuve, 2012) and *Ágora* (Alejandro Amenábar, 2009) the main character and plot are developed by a scientific woman; for this reason, there are no other relevant interactions. As a result, these two movies would not pass the third question from the Bechdel test. Considering this, in this thesis, the Greimas Actantial Method adapted was the complementary tool.

In the meantime, while using the Greimas Actantial Method in future research, academics should consider that to be effective in its use, it should be between 1) comparable variables, 2) selecting a representative sample, 3) shaping the qualification questions to what the scope of the research questions is. Otherwise, the results would not be as accurate.

Lastly, along with the fourth publication, a new piece of research will come next to compare professional ideologies with gender perspectives applied in Spain, with the aim to find cultural and professional ideologies challenges or consistencies to prove the rigid paradigm behind STEAM sectors (North-South European countries).

Síntesis en Español (Spanish summary)

Given that the present doctoral dissertation is written in English, a summary covering the background, aim, methodology, results, and conclusions is included in Spanish, in accordance with Rey Juan Carlos University policies.

7. SÍNTESIS EN ESPAÑOL / SPANISH SUMMARY

La pandemia por el Covid-19 obligó a las economías globales a una rápida transformación digital, hoy en día casi todas las tareas o posiciones laborales pueden ejecutarse de manera virtual, con ayudas de AI, robots, entre otros. Dicha transformación acrecentó la brecha de género en las ciencias STEAM. Hoy las mujeres se enfrentan a grandes dificultades para conectar con el mercado laboral, bien sea por no estar preparadas o carecer de las habilidades necesarias, conocimientos técnicos o incluso acceso a las tecnologías que aseguren su participación y desarrollo en esta economía digital global. Esta tesis centra su atención en países europeos donde la lucha por la igualdad y equidad de género es hoy en día un imperativo, que busca impulsar la participación, representación social y liderazgo de las mujeres en STEAM.

La desigualdad de género en los sectores STEAM es un tema complejo y arraigado socialmente de diferentes maneras, se extiende desde la falta de modelos de liderazgo, los estereotipos de género, la socialización de sistemas de creencias sobre la incongruencia del género, entre otros (Kuschel et al., 2020). Algunos autores explican lo que para ellos representa el origen de la infrarrepresentación de la mujer en STEAM, algunos consideran que se debe a la segregación de género que finalmente, impacta en las políticas de trabajo (Schlenker, 2015); la falta de modelos de liderazgo, la falta de confianza y seguridad o síndrome del impostor (Ellis et al., 2016; Mayo et al., 2012); el efecto matilda, techo de cristal y acantilado de cristal (Botella et al., 2019; Carr et al., 2019; Denend et al., 2020; Makarem & Wang, 2020). Dentro del espectro STEAM se encuentran una gran variedad de enfoques en el discurso académico.

Por esta razón este estudio exploratorio presenta varias miradas sobre como se ha enmarcado y comprendido a la mujer en STEAM, desde el discurso académico y de los medios, en conexión con conceptos como las representaciones sociales, las ideologías profesionales, teorías de género y vigilancia epistemológica, analizando así las relaciones de poder y otros mecanismos que perpetúan las disparidades de género en estos sectores.

Objetivos

La investigación en el campo de la infrarrepresentación y liderazgo femenino en STEAM ha incrementado en la última década, los académicos se debaten entre múltiples razones para explicar este fenómeno, por ejemplo, la cuestión de la elección de una trayectoria profesional, la validación de conocimientos técnicos en STEAM y confianza personal, la influencia del estímulo familiar, modelos de conducta, techo de cristal, acantilado de cristal, entre otros. Sin embargo, no hay evidencia de estudios que aborden un análisis del discurso científico y de los medios, y su encuadre sobre la representación social de la mujer en las industrias STEAM.

De acuerdo con lo anterior, el objetivo principal de esta tesis realizar un análisis exploratorio de las representaciones sociales en los medios de comunicación y discursos académicos sobre la participación y liderazgo de las mujeres en sectores STEAM, considerando a Lituania como caso de estudio en el contexto europeo.

A partir de este objetivo general, se proponen los siguientes objetivos específicos que están en consonancia con el compendium de publicaciones realizadas:

Con el fin de conocer el discurso académico sobre las mujeres en STEAM, es preciso intencionalmente revisar los hechos básicos sobre lo cuál se investiga y así, familiarizarse con las opiniones académicas buscando crear una imagen mental sobre dichas hipótesis (Neuman, 2007), que en la mayoría de los casos examinan patrones y paradigmas que cuestionar. De esta manera, el primer objetivo específico es analizar el discurso académico existente sobre la representación social y liderazgo de las mujeres en estos campos, y como los académicos han moldeado el conocimiento con una perspectiva de género. Lo anterior a través de una revisión exploratoria del discurso científico aplicando métodos cuantitativos y cualitativos que permiten alcanzar tendencias y contrastes.

Las autoridades o gobiernos a menudo dedican una cantidad considerable de recursos para aprender y focalizar esfuerzos en resolver problemas específicos, gracias a ello las personas confían en estas autoridades como base de conocimiento (Neuman, 2007, p. 3). El contexto europeo no es la excepción, a nivel supranacional desde la Comisión Europea se ha reconocido la importancia de resarcir la escasez de mujeres en el sector STEAM para ajustar las necesidades del mercado. Como resultado, la Comisión Europea asignó un plan de trabajo, con presupuesto, programas y proyectos que en conjunto buscan promover a la mujer en estas industrias. Partiendo de esta base, el segundo objetivo específico es ejecutar una revisión sistemática de los proyectos europeos focalizados en promover a la mujer en STEAM, financiados por la Unión Europea desde 2019 a 2023 en adelante.

Los modelos de liderazgo juegan un papel crucial en la representación social de las mujeres en STEAM, por cuanto permiten a mujeres y niñas sentirse reflejadas en pares que les generan gran admiración por sus intereses, capacidades, habilidades y conocimientos. Esta influencia de los medios de comunicación tiene un impacto significativo en la vida de las personas, al representar imágenes de mujeres científicas en el cine comercial. En este marco de ideas, se entrelazan conceptos de mediaciones, psicología social y teoría de los posibles yo, con las teorías de género develando de forma disruptiva dinámicas de poder detrás de los personajes cinematográficos. Así, el tercer objetivo específico es investigar de qué manera el cine comercial retrata a las mujeres científicas, con posiciones de liderazgo en estas industrias, usando la prueba de Bechdel y el Método Actancial de Greimas adaptado.

Considerando que el conocimiento es jerarquizado, y de esta manera se perpetúan dinámicas de poder dentro del ámbito STEAM. El Análisis Crítico del Discurso (CDA) se convierte en un imperativo, ampliamente utilizado en ciencias sociales, para estudiar el papel del discurso y las estrategias en las relaciones sociales (Van Dijk, 1995, p. 18). De esta manera, el cuarto objetivo es realizar un CDA del liderazgo de mujeres Lituanas en estos campos, empleando un cuestionario en línea y entrevistas en profundidad para descubrir sus desafíos profesionales en estas industrias.

Lituania ha sido seleccionado como caso de estudio debido a sus iniciativas tempranas e impacto mediático en temas de igualdad de género. En STEAM, los

estereotipos perduran en los discursos académicos y de los medios, moldeando percepciones, en consecuencia, el enfoque de esta tesis se centra en cómo los discursos académicos y de los medios enmarcan a las mujeres en STEAM, con Lituania como caso de estudio europeo, con el objetivo de explorar, describir y cuestionar las ideas que contribuyen a dichos desequilibrios de género.

Metodología

Esta tesis ha empleado una colección de técnicas típicas en "la investigación social como proceso para producir conocimiento. De esta manera, es un proceso más estructurado, organizado y sistemático que las alternativas que la mayoría de nosotros usamos a diario" (Neuman, 2007, p. 3), pero es un método efectivo para interpretar preguntas de investigación social a través de procesos científicos. Mientras la ciencia ocurre en el núcleo de una comunidad científica; esta comunidad practica la ciencia dentro de un conjunto de normas, comportamientos y actitudes que los unen y nutren el sistema. Esto se llama un paradigma.

Este estudio se enmarca en comprender cuáles son los paradigmas dominantes (Urry, 1973) en la investigación científica de la mujer como sujeto en el sector STEAM. Pues, muy a pesar que las mujeres en STEAM han sido analizadas durante más de dos décadas, los problemas estructurales persisten, lo que demuestra que son necesarios nuevos paradigmas de investigación novedosos para que la comunidad científica cambie su enfoque.

Reflexionando sobre el tema con una perspectiva de género utilizando las teorías previamente expuestas en el estado del arte en yuxtaposición con las ideologías profesionales, mediaciones y roles de congruencia, es posible explorar y describir las contribuciones científicas al campo de estudio. Por lo tanto, el uso de metodologías mixtas permite recopilar diferentes tipos de datos para buscar patrones, avances y contrastes.

Esta tesis emplea un análisis exploratorio de series temporales con elementos descriptivos para obtener una comprensión completa y precisa del tema. Es exploratorio para examinar el área de conocimiento, buscando formular las preguntas correctas. Por lo tanto, tiende a utilizarse datos cualitativos (Neuman, 2007, p.16). Además, existen matices descriptivos, "buscando desarrollar una idea sobre un fenómeno social y describirlo" (Neuman, 2007, p. 16); en este tipo de investigación, es común utilizar encuestas y análisis de contenido, entre otros procedimientos realizados en esta tesis.

Resultados

Este estudio sobre las mujeres en STEAM (Ciencia, Tecnología, Ingeniería, Arte y Matemáticas) revela una tendencia significativa en la investigación en este campo. Entre 2008 y 2015, el 30% de la investigación se centró en este tema, pero experimentó un aumento sustancial al alcanzar el 70% entre 2016 y 2020. Sin embargo, persisten desafíos importantes, como desequilibrios de género en la autoría de investigaciones, con un 74% de los trabajos escritos por mujeres. Esto destaca la

falta de participación masculina en la investigación, lo que puede perpetuar las desigualdades de género. A pesar de abordar temas como la colaboración en la investigación, las desigualdades y las trayectorias profesionales en STEAM, se destaca la necesidad de un enfoque más multidisciplinario e interseccional, que incluya el campo de las artes y considere las experiencias de diversas mujeres en estos sectores.

En el ámbito académico, se emplean principalmente métodos programados y documentales, centrándose en agendas públicas y privadas, tanto en entornos de investigación en línea como fuera de línea. Aunque la academia ha contribuido significativamente al estudio de la representación de las mujeres en STEAM, la investigación tiende a ser descriptiva en lugar de orientada a la acción, lo que podría fomentar un cambio social más amplio en el liderazgo y la participación de las mujeres en estos campos. En resumen, los resultados indican un cambio en los patrones de publicación, la colaboración y resaltan las desigualdades de género en la autoría de investigaciones, señalando fortalezas y deficiencias en el enfoque y las metodologías de investigación, y destacando la necesidad de una exploración más diversa y una consideración más integral de la interseccionalidad en el estudio de las mujeres en STEAM.

En la segunda publicación, se destacan diferentes enfoques y estrategias para promover a la mujer en la ciencia, los proyectos desarrollados se centran en su mayoría en atender la problemática desde la educación STEAM, el acceso y la participación en el mercado laboral, diseño, planeación y programación de planes de igualdad de género en organizaciones STEAM. Se subraya la diversidad en los tipos de resultados e impactos esperados de dichos proyectos, aunque una limitación importante es que solo CORDIS tiene acceso abierto a documentos en su base de datos.

La tercera publicación se enfoca en la representación de las mujeres en películas comerciales, destacando cómo el cine puede actuar tanto como un reflejo de estereotipos de género arraigados como una fuerza para desafiar las normas sociales. Se subraya enfáticamente la importancia del análisis de estas representaciones para comprender cómo moldean la percepción pública de las mujeres en campos STEAM. El poder del cine para influir en la sociedad se reconoce aquí, y se enfatiza que puede ser tanto un perpetuador de estereotipos como un medio para desafiarlos. Este estudio pone de relieve la necesidad de una mirada crítica y profunda a las imágenes que vemos en pantalla y cómo impactan en nuestras creencias y comportamientos.

En el último capítulo, se desglosa la representación social de las mujeres líderes en campos STEAM en Lituania. Dentro de los perfiles de mujeres evaluados, estas informantes desafiaron las normas de género y se destacan sus características de liderazgo y capacidad de resiliencia en sus respectivas disciplinas. La influencia de la familia y la importancia de la validación del conocimiento también se resaltan en este capítulo como ejes centrales.

Estos capítulos, en conjunto, ofrecen una panorámica completa y esclarecedora de la representación y participación de las mujeres en campos STEAM,

desde la esfera de la investigación académica hasta el mundo del cine comercial, y finalmente, la experiencia personal de líderes en estos campos en Lituania.

Discusión & Conclusiones

En el contexto de la pandemia de Covid-19, el interés por promover y alentar la participación de las mujeres en campos STEAM ha aumentado significativamente, tanto en países europeos como en todo el mundo. Sin embargo, los resultados obtenidos revelan que la mayoría de la investigación proviene de instituciones estadounidenses en lugar de europeas. Esto sugiere que las colaboraciones científicas son más sólidas entre universidades en los Estados Unidos que en los países europeos. A pesar de ello, se ha identificado una cantidad significativa de investigación en proyectos de la Unión Europea que no se encuentra publicada en las principales bases de datos de investigación internacionales.

Es importante destacar que la mayoría de la investigación en este campo está siendo realizada por mujeres, lo que es un reflejo de la creciente participación femenina en STEAM. Sin embargo, es importante involucrar la participación de colaboradores masculinos en el estudio de las mujeres en STEAM como una forma de derribar barreras y co-crear nuevas realidades en igualdad de condiciones.

El discurso académico se centra en una serie de cuestiones relacionadas con las mujeres en STEAM, como su participación en la industria, la educación STEAM, la investigación, la informática, el espíritu empresarial y más. A pesar de los contextos diferentes (EE. UU. o Europa), se observa que el discurso académico es consistente en la exploración de STEAM en relación con el género. Sin embargo, se señala que, en algunos proyectos europeos, la falta de claridad en la formulación de objetivos y en la medición de resultados puede ser un desafío. La consistencia a lo largo del tiempo es esencial para lograr un cambio social significativo.

Asimismo, en el último estudio se acentúa la importancia de que las mujeres desarrollen su agencia y resiliencia para superar las normas de género impuestas en los campos de STEAM, lo que es fundamental para transformar la narrativa y avanzar hacia un futuro más inclusivo y equitativo. Lituania, como caso de estudio en el contexto europeo, juega un papel importante al proporcionar perspectivas valiosas sobre las experiencias de las mujeres en STEAM en una región específica de Europa, enriqueciendo aún más la comprensión de este tema a nivel global, desde dejar en claro la relevancia de la interseccionalidad, así como, de la agencia que permitió a estas mujeres lograr grandes metas aún en medio de ambientes hostiles.

En última instancia, estos estudios revelan que, aunque se ha avanzado en la comprensión de las desigualdades de género en STEAM, existe una necesidad apremiante de abordar estos problemas desde perspectivas multidisciplinarias y epistemológicas innovadoras. El poder de los discursos académicos y de los medios de comunicación es innegable en la configuración de la percepción pública, pero para lograr un cambio real y duradero en la representación de género en STEAM, se requieren intervenciones multidimensionales que generen soluciones viables.

8. COMPENDIUM OF PUBLICATIONS

Note: This section features content taken directly from previously published materials in various journals and editorials. These publications were released at different times due to revisions, but we have structured them here to align coherently with the author's intended research plan.

Publication 1

8.1. “Scholarly Discourse About Women in the STEAM Fields: An Exploratory Study on Scientific Literature”

**INVESTIGACIÓN EN
CONTEXTOS
EDUCATIVOS
FORMALES, NO
FORMALES E
INFORMALES:
DESCUBRIENDO
NUEVOS HORIZONTES
EN LA EDUCACIÓN**

Juan José Victoria Maldonado
Blanca Berral Ortiz
José Antonio Martínez Domingo
Daniel Camuñas García



Dykinson, S.L.

Juan José Victoria Maldonado
Blanca Berral Ortiz
José Antonio Martínez Domingo
Daniel Camuñas García

**INVESTIGACIÓN EN CONTEXTOS EDUCATIVOS
FORMALES, NO FORMALES E INFORMALES:
DESCUBRIENDO NUEVOS HORIZONTES EN LA
EDUCACIÓN**

Todos los derechos reservados. Ni la totalidad ni parte de este libro, incluido el diseño de la cubierta, puede reproducirse o transmitirse por ningún procedimiento electrónico o mecánico.

Cualquier forma de reproducción, distribución, comunicación pública o transformación de esta obra solo puede ser realizada con la autorización de sus titulares, salvo excepción prevista por la ley.

Diríjase a CEDRO (Centro Español de Derechos Reprográficos) si necesita fotocopiar o escanear algún fragmento de esta obra (www.conlicencia.com; 91 702 19 70 / 93 272 04 47)

© Copyright by

Los autores

Madrid, 2023

Editorial DYKINSON, S.L. Meléndez Valdés, 61 - 28015 Madrid

Teléfono (+34) 91 544 28 46 - (+34) 91 544 28 69

e-mail: info@dykinson.com

<http://www.dykinson.es>

<http://www.dykinson.com>

Consejo

Editorial

véase

www.dykinson.com/quienessomos

Los editores del libro no se hacen responsables de las afirmaciones ni opiniones vertidas por los autores del mismo. La responsabilidad de la autoría corresponde a cada autor, siendo responsable de los contenidos y opiniones expresadas. El contenido de este libro ha sido sometido a un proceso de revisión y evaluación por pares ciegos.

ISBN: 978-84-1170-560-8

ÍNDICE

1.	INTRODUCCIÓN.....	11
2.	LA COMPETENCIA DIGITAL EN LA EDUCACIÓN SUPERIOR Juan José Victoria Maldonado, Jose Antonio Martínez Domingo, Marta Montenegro Rueda y José Fernández Cerero	13
3.	LA MUJER EN EL ÁMBITO MUSICAL. PROPUESTA DE INTERVENCIÓN DIDÁCTICA EN EDUCACIÓN INFANTIL Y EDUCACIÓN PRIMARIA Andrea Gracia Zomeño, Emilio López Parra, Eduardo García Toledano y Ascensión Palomares Ruiz	19
4.	PRINCIPALES CARACTERÍSTICAS DE LA METODOLOGÍA DE GAMIFICACIÓN EN EDUCACIÓN PRIMARIA Jose Antonio Martínez Domingo, Juan José Victoria Maldonado, José Fernández Cerero y Marta Montenegro Rueda.....	27
5.	INCIDENCIA DEL PROGRAMA PRONIE EN EL DESARROLLO DE VOCACIONES CIENTÍFICAS EN COSTA RICA Esterlyn Quesada Brenes y Jon Bustillo Bayón	35
6.	VALIDACIÓN DE UN CUESTIONARIO SOBRE COMPETENCIA DIGITAL DOCENTE EN MÉXICO Oscar Daniel Gómez Cruz, Luis Marqués Molías y Ricardo Maldonado Domínguez.....	45
7.	DISEÑO E IMPLEMENTACIÓN DE UN SOFTWARE PARA EL ENTRENAMIENTO Y EVALUACIÓN DE LA ENTONACIÓN EN INSTRUMENTOS MUSICALES. EL CASO DE PLECTRUS Jesús Tejada, Remigi Morant y Adolf Murillo.....	57
8.	INTERVENTION IN BULLYING IN THE CLASSROOM: A PROPOSAL BASED ON THE USE OF TICS Noelia Navarro Gómez	69
9.	CONTRIBUTIONS OF SERIOUS GAMES TO THE FIELD OF EDUCATION Noelia Navarro Gómez	77
10.	DE LA SEMILLA AL CRISTAL: ¿QUÉ APRENDEN LOS ESTUDIANTES DE SECUNDARIA EN UN CONCURSO ESCOLAR? Jorge Martín-García y María Eugenia Dies Álvarez	85
11.	PERCEPCIÓN DE LOS ESTUDIANTES DE EDUCACIÓN SUPERIOR SOBRE LA RETROALIMENTACIÓN EVALUATIVA VIVIDA Flor María Mella-Mella, María Amparo Calatayud Salom y Ángel Joaquín Lucas Calatayud.	97
12.	TEMAS DE TRABAJO FIN DE GRADO SELECCIONADOS POR LOS ALUMNOS DE PEDAGOGÍA TERAPÉUTICA EN LA FACULTAD DE EDUCACIÓN DE CUENCA Andrea Gracia Zomeño, Mariano Herráiz Gascueña, Amparo Martínez Cano y Ascensión Palomares Ruiz	107
13.	TALLERES DE RETROALIMENTACIÓN PARA EL DESARROLLO DE LA CREATIVIDAD EN NIÑOS Y NIÑAS DE LA ZONA RURAL DEL PERÚ Haydee Clady Ticona-Arapa, Angie Deisy Quispe Mamani y Kymberly Nadyne Ccosi Ayna	115
14.	CHÍCHAM UNUIMIARTIN. MODELO DE ALFABETIZACIÓN MEDIÁTICA DIGITAL PARA LA EDUCACIÓN INTERCULTURAL BILINGÜE EN ECUADOR Meset Fernando Mashingashi Unkuch y Angel Torres-Toukourmidis	127
15.	METODOLOGÍAS TRADICIONALES Y EL USO DE FLIPPED CLASSROOM: UN ESTUDIO COMPARATIVO SOBRE LA PERCEPCIÓN DEL ALUMNADO Nieves Moyano, Rocío Linares, Cristina Lendínez y M. Teresa Cerezo.....	149
16.	PROGRAMAS DE LUCHA CONTRA EL ABSENTISMO ESCOLAR. TRABAJANDO CON ADOLESCENTES DESDE LA EDUCACIÓN NO FORMAL Juan Manuel Bellido Cáceres y Antonia Lozano Díaz	149
17.	EDUCACIÓN INCLUSIVA Y DIGITAL DURANTE LA PANDEMIA: EL PAPEL DE LOS DIRECTORES/AS Antonia Lozano-Díaz y Juan Manuel Bellido Cáceres.....	161
18.	PROYECTO “PRACTICS”: MEJORA DE LAS COMPETENCIAS DIGITALES DE FUTUROS DOCENTES A TRAVÉS DE PRÁCTICAS BASADAS EN LAS METODOLOGÍAS ACTIVAS Y GAMIFICACIÓN EDUCATIVA Pablo Usán Supervía.....	169

19.	PRACTICS: PROYECTO DE GAMIFICACIÓN EN LAS PRÁCTICAS DE “PSICOLOGÍA DEL DESARROLLO” DEL GRADO DE MAGISTERIO DE EDUCACIÓN PRIMARIA (UNIVERSIDAD DE ZARAGOZA)	
	Pablo Usán Supervía.....	179
20.	GAMIFICACIÓN EN EDUCACIÓN SUPERIOR: UNA PROPUESTA FORMATIVA EN EDUCACIÓN MUSICAL	
	Sara Domínguez-Lloria y Mario Diz-Otero.....	187
21.	EL AGUA, EN EL CENTRO DE LOS ODS, Y LOS FUTUROS DOCENTES DE EDUCACIÓN PRIMARIA	
	Alejandra Ramírez-Segado, María Rodríguez-Serrano y Alicia Benarroch Benarroch	199
22.	COMPETENCIAS DIGITALES EN EL FUTURO PROFESORADO: ¿ESTAMOS PREPARADOS PARA LA EDUCACIÓN DEL SIGLO XXI?	
	Estibaliz Cepa-Rodríguez y Vanesa Lancha-Villamayor	209
23.	APROXIMACIÓN A LA CULTURA DIGITAL POST-PANDÉMICA: POSESIÓN Y USOS DE RECURSOS DIGITALES EN ESTUDIANTES UNIVERSITARIOS DEL NOROESTE DE MÉXICO	
	Patricio Henríquez Ritchie, Fernando de Jesús Domínguez Pozos y Oscar Ricardo Osorio Cayetano	221
24.	EL LÉXICO PEDAGÓGICO, ACERCAMIENTO EPISTEMOLÓGICO	
	Irene Alvarez Alonso, Yelena Abreu Alvarado y Karina Machín Hernández	233
25.	CONCEPCIONES DE LOS FUTUROS PROFESORES DE EDUCACIÓN SECUNDARIA PARA SU FORMACIÓN EN TIEMPO HISTÓRICO	
	María Pilar Molina-Torres	245
26.	VALORACIÓN Y USO DEL AGUA: EL RÍO COLORADO	
	Cristina Vilaplana Prieto	253
27.	LA INTERVENCIÓN EDUCATIVA CLAVE PARA LA ALFABETIZACIÓN Y EDUCACIÓN EN EL OCIO DIGITAL EN JÓVENES VULNERABLES	
	Margarita Vasco-González y María Ayuso Goig.....	263
28.	EDUCOMUNICACIÓN DE PRÁCTICAS ANCESTRALES: TEMAZCALES EN GUAYAQUIL, ECUADOR	
	Guadalupe Vernimmen Aguirre y Omar Sempértegui Zabala	275
29.	INNOVACIÓN: CLAVE EN LA ENSEÑANZA DEL INGLÉS	
	Karla Ivette Nieto Chávez y Lynda Salinas Cervantes	283
30.	DESARROLLO COMUNITARIO BASADO EN ARTE Y CIENCIA PARA LA INCLUSIÓN SOCIAL EN IBEROAMÉRICA	
	Rodolfo Jiménez León y Edith Juliana Cisneros Cohernour.....	291
31.	ESTRATEGIAS NEURODIDÁCTICAS EN LA PRÁCTICA DOCENTE UNIVERSITARIA DE LAS CARRERAS DE CIENCIAS EMPRESARIALES	
	Adriana Estefanía Mónico Bordino y José María Garcete Gómez.....	303
32.	RELATIONSHIP OF RESILIENCE AND SELF-ESTEEM TO SOCIAL COMPETENCE	
	Luis Pablo Hernández-López y Miriam Romero-López	311
33.	METODOLOGÍAS ACTIVAS EN LA FORMACIÓN DE PROFESORES DE MATEMÁTICA	
	Mariela Carvacho Bustamante	325
34.	LA CONFIGURACIÓN DE LA SUBJETIVIDAD TECNOLÓGICA EN LA ERA DEL TRANSHUMANISMO	
	Ferran Sánchez Margalef e Isabel Vilafranca Manguan.....	331
35.	LA INTEGRACIÓN LABORAL COMO FACTOR CLAVE PARA LA AUTONOMÍA EN JÓVENES TUTELADOS	
	Rosa Goig-Martínez e Isabel Martínez-Sánchez.....	339
36.	LAS PÁGINAS VIRTUALES EN LOS PROCESOS DE INTERPRETACIÓN DEL LENGUAJE NO VERBAL	
	Jenny Alejandra Pérez Páez	349
37.	CONOCIMIENTO Y USO DE RECURSOS EDUCATIVOS ABIERTOS EN UNA UNIVERSIDAD MEXICANA. PEA, REA, LICENCIAS Y CONOCIMIENTO ABIERTO	
	Montserrat García Guerrero y Martha Susana Hernández Larios.....	359
38.	EL MOBILE LEARNING COMO METODOLOGÍA PARA FAVORECER LA DIMENSIÓN PRAGMÁTICA EN PREESCOLAR	
	Martha Susana Hernández Larios, Fátima Monserrat Martínez García, Monserrat García Guerrero y Alejandro Rodolfo García Villalobos.....	369

39.	¿“PEINAR” EL PELO DE UNA BOLA PELUDA? GEOMETRÍA CON EL TEOREMA DE LA BOLA PELUDA: PROPUESTA PRÁCTICA PARA ACERCAR LA ESFERA EN LAS CLASES DE MATEMÁTICAS	
	Patricia Val Fernández	381
40.	SI SE LE DA EL TIEMPO SUFICIENTE A AQUELLO QUE PARECE EXTREMADAMENTE IMPROBABLE, ¿PUEDE SUCEDER!. APLICACIONES DEL TEOREMA DEL MONO INFINITO EN LAS AULAS DE SECUNDARIA EN CONSONANCIA CON EL DESARROLLO DE HABILIDADES EMOCIONALES	
	Patricia Val Fernández	389
41.	TAXONOMÍA DEL ESTRÉS, ESTRESORES Y ESTRATEGIAS PARA SU AFRONTAMIENTO EN ESTUDIANTES UNIVERSITARIOS	
	Lionel Sánchez-Bolívar y Lindsay Michelle Vázquez.....	397
42.	ANÁLISIS DE HABILIDADES SOCIALES DEL ALUMNADO DE PRIMER CICLO DE EDUCACIÓN PRIMARIA	
	Lindsay Michelle Vázquez y Lionel Sánchez-Bolívar	407
43.	ENCENDER O APAGAR LA CÁMARA DURANTE LAS CLASES EN LÍNEA: LA POSTURA DE ESTUDIANTES UNIVERSITARIOS	
	Claudia Saucedo Ramos, Claudia Elisa Canto Maya, Gilberto Pérez Campos y Gustavo Montalvo Martínez.	417
44.	REVISIÓN SOBRE LA RELACIÓN ENTRE INTELIGENCIA EMOCIONAL Y RENDIMIENTO ACADÉMICO EN UNIVERSITARIOS	
	Ainhoa Martínez-Rodríguez y Camino Ferreira	427
45.	ANÁLISIS DE LAS VARIABLES DE LA INTELIGENCIA EMOCIONAL EN EL ESTUDIO DE SU RELACIÓN CON EL RENDIMIENTO ACADÉMICO	
	Ainhoa Martínez-Rodríguez y Camino Ferreira	439
46.	EDUCACIÓN DE CALIDAD, DENTRO DEL CAMPO DE LA INGENIERÍA	
	Shaila Alvarez Junco, Pedro Salinas Valdez y Susana Edith Uribe Colin	451
47.	DESARROLLO DE HABILIDADES PRÁCTICAS CON BASE EN UN CURSO EN LÍNEA PARA EL MEJORAMIENTO EN EL ÁREA DE TELECOMUNICACIONES EN UN ÁREA ADMINISTRATIVA	
	Alejandro Rodolfo García Villalobos, Martha Susana Hernández Larios y José de Jesús Hernández Berumen.....	461
48.	LA INNOVACIÓN DOCENTE EN LA UNIVERSIDAD: UNA PROPUESTA DE MOTIVACIÓN PARA EL ALUMNADO DESDE LA PERSPECTIVA SOCIOLÓGICA	
	Milagrosa Bascón Jiménez.....	473
49.	EDUCACIÓN EMOCIONAL EN EL PROCESO DE ENSEÑANZA-APRENDIZAJE DEL ALUMNADO CON TRASTORNO POR DÉFICIT DE ATENCIÓN CON HIPERACTIVIDAD (TDAH)	
	Sandra Cabello-Sanz	481
50.	DISEÑO DE INSTRUMENTO SOBRE AUTORREGULACIÓN DEL APRENDIZAJE DE ESTUDIANTES UNIVERSITARIOS EN ENTORNOS VIRTUALES. ESTUDIO PILOTO	
	Marcelino Trujillo Méndez.....	491
51.	LA NEURODIDÁCTICA COMO INNOVACIÓN EDUCATIVA PARA LA INCLUSIÓN	
	Cristina Marín Perabá.....	501
52.	¿CÓMO LA COMUNIDAD ESCOLAR RESPONDE A LAS CRISIS EN YUCATÁN?	
	Andrea Vázquez Santos y Pedro Sánchez Escobedo.....	513
53.	INSTAGRAM COMO HERRAMIENTA DE REFLEXIÓN PERSONAL Y COMPARTIDA EN LAS AULAS UNIVERSITARIAS. UN CASO CON ESTUDIANTES DEL MÁSTER UNIVERSITARIO “ESTUDIOS AVANZADOS DE EDUCACIÓN EN LA SOCIEDAD GLOBAL”	
	José Antonio Cieza García y Eva García Redondo.....	521
54.	EL RETO DE LA ELECTRICIDAD EN EL MARCO DE UN PROYECTO STEAM: ESTUDIOS DE CASO EN LA FORMACIÓN DE MAESTRAS/OS	
	Francisco Javier Serón Torrecilla, Carlos Rodríguez Casals y Ana de Echave Sanz	533
55.	UN CLUB DE CIENCIAS EN LA ESCUELA ¿PARA QUÉ?	
	Jorge Martín-García, Ana Sofía Cavadas Afonso y María Eugenia Dies Álvarez	543
56.	PERCEPCIONES DEL ALUMNADO SOBRE LA INNOVACIÓN CON TIC EN EDUCACIÓN SUPERIOR MEDIANTE EL USO DE REDES SOCIALES	
	Eugenia Fernández-Martín.....	555
57.	PERSPECTIVA DE GÉNERO EN LA FORMACION INICIAL DOCENTE: SITUACIÓN CHILE-ESPAÑA. UNA REVISIÓN BIBLIOGRÁFICA	
	Stefany Cordero Aliaga y M. ^a Asunción Romero López	563

58.	EDUCACIÓN NO FORMAL Y DEPORTE EN UN EQUIPO DE FÚTBOL FEMENIL EN UNA COMUNIDAD DE YUCATÁN	
	Cinthia May Irigoyen y Juan Carlos Mijangos Noh	573
59.	PATRIMONIO CULTURAL A DEBATE EN LA FORMACIÓN DEL PROFESORADO DE EDUCACIÓN PRIMARIA	
	Gemma Muñoz García y Esther Jiménez Pablo.....	581
60.	HACEMOS TEATRO COMUNITARIAMENTE A TRAVÉS DEL APRENDIZAJE-SERVICIO	
	Ruth Llopis Cuenca y Arecia Aguirre García-Carpintero	593
61.	LA PROMOCIÓN DE CONEXIONES ENTRE APRENDIZAJES Y/O CONTEXTOS DE ACTIVIDAD: APLICACIÓN Y PERCEPCIÓN DEL IMPACTO POR PARTE DE LOS DOCENTES	
	Clara Madrid Alejos y Judith Oller Badenas	603
62.	DESAFÍOS Y CAMBIOS EN LA ORGANIZACIÓN DE LA ENSEÑANZA CON EL RETORNO A LA PRESENCIALIDAD. UN ESTUDIO EN LA REGIÓN PIURA-PERÚ	
	Marcos Augusto Zapata Esteves, Flor Manuela Hau Yon Palomino, Luis Enrique Guzmán Trelles y Jean Pierre Gómez Espinoza.....	615
63.	ANÁLISIS DE LOS BENEFICIOS DE LA APLICACIÓN DE LA EVALUACIÓN FORMATIVA EN UN PROYECTO GRUPAL E INTERDISCIPLINAR EN 1º DE BACHILLERATO	
	José Luis Álvarez-Sánchez, Ángel Pérez-Pueyo y David Hortigüela-Alcalá	627
64.	'FOODIE GAME': LA ALIMENTACIÓN Y NUTRICIÓN EN SECUNDARIA A TRAVÉS DEL APRENDIZAJE BASADO EN JUEGOS	
	José Luis Álvarez-Sánchez, Aroa Costa-Feito, Ángel Pérez-Pueyo y David Hortigüela-Alcalá	639
65.	EL APRENDIZAJE BASADO EN PROYECTOS EN EL MARCO DE LA ASIGNATURA DE BOTÁNICA APLICADA	
	M ^a Ángeles Aragón González	649
66.	STUDYTELLING: UNA PROPUESTA PARA LA COMPRESIÓN PÚBLICA DE LA CIENCIA A TRAVÉS DEL DIGITAL STORYTELLING EN UN ECOSISTEMA DIGITAL	
	Rómulo Andrés Gallego Torres	659
67.	LA APLICABILIDAD Y FUNCIONABILIDAD DE LAS APPS PARA ALUMNADO CON AUTISMO: PERCEPCIÓN DE PROFESORADO DE FLORENCIA (ITALIA)	
	Carmen del Pilar Gallardo Montes, Antonio Rodríguez Fuentes, María Jesús Caurcel Cara y Paula Peregrina Nievas.....	673
68.	ANSIEDAD MATEMÁTICA EN FUTUROS MAESTROS DE PRIMARIA	
	María Teresa Costado Dios.....	683
69.	REFLEXIÓN PEDAGÓGICA SOBRE LA EDUCACIÓN A DISTANCIA E INCLUSIVA EN EL ESCENARIO UNIVERSITARIO: UNA CUESTIÓN SOBRE LAS COMPETENCIAS DIGITALES	
	Estela Isequilla Alarcón y María Martín Delgado.....	691
70.	PROCESO DE EVALUACIÓN EN FUTUROS MAESTROS DE PRIMARIA	
	María Teresa Costado Dios.....	701
71.	PLANTEAMIENTOS COEDUCATIVOS EN LOS CENTROS ESCOLARES Y SU VINCULACIÓN CON LOS ODS	
	Iratxe Suberviola Ovejas	709
72.	ENGAGEMENT DE FACEBOOK, INSTAGRAM Y TWITTER EN EL ÁMBITO DE LA UNIVERSIDAD PÚBLICA ESPAÑOLA	
	Javier Rodríguez Laíz, Davinia Martín Critikián, Marta Medina Núñez y Ángela Ávila Peiró.....	719
73.	LA EDUCACIÓN EMOCIONAL PARA FAVORECER EL DOMINIO AFECTIVO EN EL GRADO DE MAGISTERIO DE EDUCACIÓN PRIMARIA	
	Paula Meizoso Trujillo, Julián Roa González, Almudena Sánchez Sánchez y José Luis Díaz Palencia	731
74.	DIAGNÓSTICO DEL USO DE LAS TIC EN ESTUDIANTES DE UNA ESCUELA SECUNDARIA DE MÉRIDA, YUCATÁN	
	Bianey Sel Lara y Sergio Quiñonez Pech.....	741
75.	DIDÁCTICA Y LA EDUCACIÓN AMBIENTAL NO FORMAL, EN EL MARCO DE LA EDUCACIÓN SOCIAL: UN ESTUDIO BIBLIOMÉTRICO	
	Francisco Javier Bedoya-Rodríguez, Carlos Eduardo Guevara-Fletcher y Jonathan Steven Pelegrin-Ramírez.....	751
76.	CONOCIMIENTO DE LOS ESTUDIANTES DE CIENCIAS DE LA SALUD SOBRE LOS COMPONENTES DEL PROTOCOLO DE INVESTIGACIÓN CIENTÍFICA	
	Sebastián Reyes Alvarado	763

77.	INCLUSIÓN ESCOLAR: CAMINOS DE LA ACCIÓN DOCENTE	
	Júlio César da Silva Corrêa.....	771
78.	INCLUSIÓN EDUCATIVA: PROBLEMAS DE LECTURA Y SÍNTOMAS EMOCIONALES DE LAS PERSONAS CON DISLEXIA	
	María Martín Delgado y Estela Isequilla Alarcón.....	779
79.	LA BÚSQUEDA DE LAS FUENTES DEL NILO. UN PROYECTO DIDÁCTICO DE CIENCIAS SOCIALES PARA EL AULA DE CUARTO DE LA ESO A TRAVÉS DEL CINE	
	Juan Manuel Alonso Gutiérrez.....	787
80.	IMPORTANCIA DE LAS METODOLOGÍAS ACTIVAS EN LA EDUCACIÓN FÍSICA: REVISIÓN SISTEMÁTICA SOBRE LAS METODOLOGÍAS PARA EL FOMENTO DE LA AUTONOMÍA.	
	Manuel Gómez-López, José Francisco Jiménez-Parra, Paulo Martins y David Manzano-Sánchez.....	799
81.	THE CREATIVITY-SPONTANEITY PROCESS IN SPORTS: CASE STUDY FROM THE COACH'S PERSPECTIVE	
	Paulo Martins, Luis Preto, Manuel Gómez-López y David Manzano-Sánchez.....	813
82.	¿QUÉ SABEN LOS MAESTROS DE LA DOCENCIA CON DISPOSITIVOS MÓVILES? AUTOEVALUACIÓN PARA EL DISEÑO DE ACTIVIDADES EDUCATIVAS	
	Judith Balanyà Rebollo y Janaina Minelli De Oliveira.....	823
83.	EVALUACIÓN DEL IMPACTO SOCIAL DE LA CÁTEDRA DE EDUCACIÓN FINANCIERA EN UNA INSTITUCIÓN EDUCATIVA PÚBLICA COLOMBIANA	
	María Jenny Albornoz Silva, Sergio Fernando Garcés Arias y Jorge Alberto Salazar Rodríguez....	835
84.	ANÁLISIS COMPARATIVO DE LAS BARRERAS DE APRENDIZAJE Y PARTICIPACIÓN EN MÉXICO Y ESPAÑA: APRENDIZAJE INCLUSIVO PARA MEJORAR LAS COMPETENCIAS PROFESIONALES DE LOS FUTUROS DOCENTES	
	Nuria Andreu-Ato y Marta Ruiz Revert.....	843
85.	ANÁLISIS DE LA SITUACIÓN SOCIOECONÓMICA DE BUCARAMANGA Y SU ÁREA METROPOLITANA POR EL FLUJO MIGRATORIO DE LAS PERSONAS PROVENIENTES DE VENEZUELA DURANTE EL AÑO 2020, FASE 1.	
	Sergio Fernando Garcés Arias, María Jenny Albornoz Silva y Jorge Alberto Salazar Rodríguez....	855
86.	EL LIDERAZGO INCLUSIVO EJERCIDO POR LOS DIRECTORES DE LOS CENTROS DE EDUCACIÓN OBLIGATORIA DE ANDALUCÍA (ESPAÑA). PERSPECTIVA DE LAS FAMILIAS	
	Emilio Crisol-Moya, María Asunción Romero-López, Antonio Burgos-García y Yéssica Sánchez-Hernández.....	865
87.	DESAFÍOS EN LA IMPLICACIÓN ACTIVA DURANTE LA IMPLEMENTACIÓN DE LA METODOLOGÍA "FLIPPED CLASSROOM" EN LA EDUCACIÓN UNIVERSITARIA	
	Ángel Carnero- Díaz, Ángela Sánchez Gómez y Javier Pecci.....	875
88.	EVALUACIÓN DE LA EFECTIVIDAD DE UNA PROPUESTA DE INTERVENCIÓN EN PRIMEROS AUXILIOS EN 4º DE ESO MEDIANTE EL DISEÑO DE LA APP "PPAA.EF" Y EL USO DE RECURSOS TIC	
	José Lahiguera Hervás, David Parra Camacho y Carlos Pérez-Campos.....	883
89.	PROYECTO DE APRENDIZAJE-SERVICIO DE PODCASTING COMO HERRAMIENTA EDUCATIVA EN EL AULA HOSPITALARIA	
	Pérez Curiel, María Jesús y Martín Rivas, Dunia.....	895
90.	FOMENTANDO EL PENSAMIENTO REFLEXIVO A TRAVÉS DEL ABP: EL CASO DE UNA INNOVACIÓN DOCENTE EN LA ASIGNATURA DE SOCIOLOGÍA URBANA, SEGÚN EL ESTUDIANTADO	
	Ana Belén Cano-Hila.....	907
91.	SCHOLARLY DISCOURSE ABOUT WOMEN IN THE STEAM FIELDS: AN EXPLORATORY STUDY ON SCIENTIFIC LITERATURE	
	Tatiana Buelvas-Baldiris, Rainer Rubira-García y Rasa Poceviciene.....	919
92.	DESARROLLO DE LA COMPETENCIA EMPRENDEDORA EN EDUCACIÓN PRIMARIA: VISIÓN APORTADA POR LOS ORIENTADORES EDUCATIVOS	
	Sara González-Tejerina, Agustín Rodríguez-Esteban y María-José Vieira.....	931
93.	APORTES DE INVESTIGACIÓN DE LA DÍADA FAMILIA-CENTRO EDUCATIVO	
	Elisa Avellaneda Reche, Marta García Romero, Sergio Moreno Gálvez y María Del Valle Serrano Delgado.....	943
94.	INFLUENCIA FAMILIAR EN LA AUTOEFICACIA EN LAS CIENCIAS NATURALES EN EDUCACIÓN PRIMARIA	
	Gloria Viviana Barinas Prieto.....	951

95.	EL COMPROMISO DEL ESTUDIANTE CON EL GRADO:ANÁLISIS DE PERFILES LATENTES Luis González Fernández y Mercedes Isabel Rueda Sánchez	959
96.	ROMPIENDO BARRERAS: EL PROGRAMA DE FORMACIÓN EN METODOLOGÍA DE LA ESCUELA CUBANA DE BALLET EN ÁFRICA Ioshinobu Navarro Sanler.	971
97.	EVALUACIÓN PSICOLÓGICA EN LA ERA DIGITAL: INTERACCIÓN ENTRE LA DEPRESIÓN Y LAS REDES SOCIALES EN INTERNET. UNA OPORTUNIDAD PARA LA INVESTIGACIÓN EN POBLACIÓN JOVEN Sebastián Vivas, Lorenzo Rodríguez-Riesco y Joaquín Villaécija.....	981
98.	ACULTURACIÓN Y PREJUICIO EN ALUMNADO INMIGRANTE MUSULMÁN Y AUTÓCTONO. UN ACERCAMIENTO A UNA REALIDAD EDUCATIVA E INTERCULTURAL Joaquín Villaécija, Sebastián Vivas y Lorenzo Rodríguez-Riesco.....	993
99.	IMPLEMENTACIÓN DE LA FORMACIÓN INTEGRAL A TRAVÉS DE ACTIVIDADES DEPORTIVAS Y CULTURALES EN UNA UNIVERSIDAD PRIVADA. PROPUESTA DE PROTOCOLO DE INVESTIGACIÓN. Jazibi Canul Alcocer y Galo López Gamboa	1003
100.	EL DESARROLLO DE HABILIDADES ASOCIADAS A LA COMPETENCIA CIENTÍFICA EN EDUCACIÓN PRIMARIA SEGÚN LOS MAESTROS EN FORMACIÓN Óscar González Iglesias, Juan Carlos Rivadulla-López, Yolanda Golías Pérez y María Jesús Fuentes-Silveira.....	1011
101.	OBJETIVO 13-ACCIÓN POR EL CLIMA Alba Dueñas Lozano, María Expósito Peña, Lucía Herrera Calvo, Ángela Martín Bravo y María Llamas Uceda.	1021
102.	LA SOSTENIBILIDAD COMO EL VERDADERO ACTO DEMOCRÁTICO EDUCATIVO EN MÉXICO David Espinosa González, Alejandra Cedallin Martínez Sánchez y Gabriel Pérez Galmiche	1031
103.	PERSPECTIVAS DE ESTUDIANTES UNIVERSITARIOS SOBRE EL ESTRÉS ACADÉMICO Yesika Yuriri Rodríguez Martínez, Mónica Judith Macías Villalpando y Emma Perla Solís Recéndez	1041
104.	EL LLAMADO DE LA ÉTICA AMBIENTAL EN LA ENSEÑANZA DE LAS CIENCIAS ANIMALES: EL DESPOJO DE LOS ANTROPOCENTRISMOS María Belalcázar Zafra, Clara Stefany Romero Hurtado y Wilson Vergara y Ariosto Ardila Silva ..	1051
105.	DESING THINKING COMO HERREMIENTA PARA LA INCLUSIÓN DEL ALUMNADO ENFERMO Y/U HOSPITALIZADO Marta Ruiz Revert y Nuria Andreu-Ato	1063
106.	PREVENCIÓN DE LA VIOLENCIA HACIA LOS PROFESIONALES DE LAS RESIDENCIAS DE MAYORES. EL DISEÑO DE UN PROGRAMA FORMATIVO Cristina Vidal-Martí	1071
107.	FUERZA MUSCULAR Y MEDIDAS ANTROPOMÉTRICAS EN ADOLESCENTES DE EDUCACIÓN SECUNDARIA OBLIGATORIA Y BACHILLERATO Eva María Peláez-Barrios, Antonio Aznar-Ballesta, Alicia Salas-Morillas y Mercedes Vernetta	1081

SCHOLARLY DISCOURSE ABOUT WOMEN IN THE STEAM FIELDS: AN EXPLORATORY STUDY ON SCIENTIFIC LITERATURE

Tatiana Buelvas-Baldiris¹

Rainer Rubira-García^{1*}

Rasa Poceviciene²

1. INTRODUCTION

Women's roles in Science, Technology, Engineering, Arts, and Mathematics (STEAM) are a pressing and prominent topic in global discussions and social agendas. UNESCO has reported that gender inequalities in STEAM education and employment lead to further disparities in status and income (UNESCO, 2019). This concern has significant implications for the industry and society, including self-reflection in scholarly literature.

The STEM acronym was created in the US by the National Science Foundation in 1990 to emphasise Science, Math, Engineering, and Technology as fields that enhance innovation (Mejias, 2020; Maeda, 2012), often disregarding the Arts field. Adding Arts to those areas of education as a new pedagogy emerged in 2007 to boost student interest and participation. However, "empirical research demonstrates that Arts enhance creativity, critical thinking, innovation, collaboration, and interpersonal communication skills" (Perignat, 2019, pp. 31-43). Artistic endeavours have been linked in past studies with Nobel scientists who performed some visual or handcraft, creative writing, and even photography or music (Root-Bernstein, 2015).

Therefore, this interest in a hybrid approach among STEAM disciplines is now growing, promoting deliberate tools, knowledge appropriation, new learning, and research methods (Mejias, 2020).

Despite previous research connecting Arts with science and creativity (Root-Bernstein, 2015), as Kuschel describes, "gender inequality in STEAM has its roots in a complex set of issues [...] is a story of stereotypes, a gender socialised belief system, a lack of role models" (2020, p. 15); female participation in the STEAM sector has been recognised as crucial to encourage scientific excellence and achieve diverse perspectives to reduce bias in knowledge development

¹ King Juan Carlos University, Madrid, Spain

² Siauliai State University of Applied Sciences, Lithuania

*Correspondence: rainer.rubira@urjc.es ; Tel.: +34-91-488-73-05

and solutions (UNESCO, 2019). In fact, studies on social justice and education claim that “scientific knowledge is produced in a highly organised social process” (Connell, 1993, pp. 31-33); such production is selected and compiled, making a curriculum. Hence, curriculums can be an instrument to generate and reinforce social class, gender division, and social power, as the knowledge in it is hierarchically organised.

Therefore, it is essential to understand the potential of this intersection with humanities. Furthermore, it is vital to continue exploring these hybrid approaches that may offer a well-rounded education and prepare students for the future of STEAM industries (Mejias, 2020; Perignat, 2019).

Covid-19 and digital transformation informed and worsened gender disparities globally (UNDP, 2021). “The European Commission (EC) predicted that the Information and Technology (IT) sector (alone) will create 7 million job openings by 2025” (Panagiota et al., 2019, p. 52). Yet, European countries face noticeable labour scarcity in the STEAM sector (Caprile et al., 2015). Unfortunately, “gender segregation in the field, career-related challenges, disproportions in senior positions, gender imbalances in access to funding and opportunities, as well as gender-blind and gender-biased research, organisational culture and institutional process” (Panagiota et al., 2019, p. 55), that permeates the social structures excluding women.

The goal of this research is to present an exploratory analysis of scientific discourse about women in STEAM using quantitative and qualitative methods. Firstly, we study literature reviews to grasp how academia shapes the knowledge in STEAM and conceives it as a field with a gender perspective. Secondly, we explore the scientific production in EBSCO to have a comprehensive analysis of how scientists are considering women in the STEAM sector. Last, we provide reflections for future trends intending to share critical insights into gender studies and STEAM fields.

Among the most critical reviews, which we analysed in the first moment of this study, we found meta-research on women entrepreneurship that discusses the micro and macro challenges women face in STEAM (Cardella et al., 2020); Women's underrepresentation in STEAM, emphasising the systemic disadvantages (Kuschel et al., 2020); Understanding the gender gap in STEAM with a focus on math-intensive disciplines (Ming-Te et al., 2017) and women's choices and preferences in STEAM careers and their relationship with creativity (Hill et al., 2012).

Later, after extracting scientific production from EBSCO, we confirmed that literature found on STEAM and gender theories presents various perspectives on the same issue. Additionally, 73% of these belong to U.S. institutions. For instance, Joan Acker's Theory argues that power dynamics in organisations perpetuate gender and intersectional inequalities in the field, validating male domination over women (Zippel et al., 2017); Gendered perceptions of global academic and STEAM collaborations that hinder women's advancement to leadership roles in academia and business (Uhly et al., 2017); Research that explores gender roles in STEAM and romantic relationships (Dunlap et al., 2019); Men's role in supporting gender equity in these fields (Sattari et al., 2017); Gender gaps in forensic sciences (Ward et al., 2019), and gender imbalances in

aviation (Halleran et al., 2019). These studies shed light on the power dynamics and complexities that women face in STEAM fields.

Gender awareness has increased the opportunities available for women to participate in various levels of society. Yet, significant gender disparities in the C-level and entrepreneurship in STEAM remain. Studies show that women face barriers such as limited access to resources, male-dominated networks, and gender-based social positioning favouring men in entrepreneurship (Cardella et al., 2020). Other research considers the contribution of women board directors to corporate social performance, emphasising the importance of gender diversity and ethical behaviours (Campopiano et al., 2022).

Current research on STEAM gender inequalities is centred on developed countries, often overlooking intersectionality with race, ethnicity, gender, sexual orientation, and religion. Disaggregated data and geographical analysis are needed to understand women's social and cultural challenges (Cardella et al., 2020).

Gender with a focus on epistemological surveillance applied to this study requires consistency in data, analysis, and theories, understanding that individual behaviour is shaped not only by rational decision-making but permeated by the social structure, including its disciplinary laws, regulations and patterns that operate beyond human awareness and intentionality (Bourdieu et al., 1991). Consequently, more scholarly communication in this analysis area can bring new perspectives to suggest improvements in scientific policies or strategies with the primary goal of promoting women in STEAM.

2. METHOD AND SAMPLE

We navigated in “one of the three most prominent vendors for general academic databases, which is EBSCO” (Blessinger & Olle, 2004, p. 335). Among EBSCO’s social sciences and humanities extensive databases, we used Academic Search Ultimate, which offers students an unprecedented collection of peer-reviewed, full-text journals, including many journals indexed in leading citation indexes (EBSCO, 2023).

To gather research from 2000 to 2020 on the related topic, the period is determined as a change of the century in which the sensitiveness about the subject in question developed with a tendency to increase in the agendas, encouraged by international organisations and global high-level meetings.

First, women in science started to be discussed frequently after the European Commission published the report “Women in Industrial Research,” which opened the space to create high-level meetings regarding the underrepresentation of women in STEAM (Rübsamen- Waigmann et al., 2003). Two years later, the Council of the European Union issued an official document (SEC 370) in March 2005 stating that among the main activities of the European Commission (EC), there was a need “to promote gender equality in science through Research Framework Programmes” (European Commission, 2005, p. 3).

In the same official document, it is mentioned that “although some progress has been achieved since the adoption of the previous reports in 1999 and 2001, the situation is still far from satisfactory” (European Commission, 2005, p. 3), recognising that efforts must be strengthened.

From this point in time, more high-level meetings, units, and programs were created to leverage women in STEAM. For instance, in 2016, UNESCO adopted an active position in its role to “encourage girls and women to be leaders in the science, technology, engineering, art/design, and mathematics fields” (UNESCO, 2016, pp. 41-42) as expressed in the decisions adopted by the executive board at its 199th session.

For this methodology, we used filters such as reviews or journals, academic, peer-reviewed, written in English, and worldwide. The keyword combinations were adapted accordingly to the search engine and maintained the same logic. The combination used for data collection was “Women” OR “Female” OR “Woman” OR “Females” AND “STEM” OR “STEAM,” also under the umbrella terms of women in science, gender inequalities, and gender. We decided to exclude non-research documents and publications that ignore gender/women's issues in STEAM, book chapters, conference reports, or essays with the same criteria.

We had an output of 240 articles, and with the support of an expert's board, the sample unit (SU) was reduced to 46 articles based on the specificity and depth of the topic developed in them. Our experts are academics and consultants who practice in the Gender in STEAM area, using as main criteria those articles that reference women and, or gender both in STEAM or STEM fields, included and further developed in the title, the abstract, and in their objectives. We then coded and analysed data in a spreadsheet to identify patterns in the scholarly discourse. We outlined an analysis plan with three main questions and sub-categories:

RQ1: What are the main features of the body of scholarly literature on women in STEAM?

Subcategories: Review title; the period for publications; collaboration between Universities; countries and gender; authorships and correspondence; field of STEAM studied.

RQ2: How the theoretical framework has shaped the academic discourse about women in STEAM?

Subcategories: Keywords; descriptors; document titles, objectives, predominant study area, localisation, scenario, and the subject of study.

RQ3: What have been the main methodological designs applied in the scholarly study of women in STEAM?

Subcategories: Data type; predominant technique; dominant document analysis; predominant triangulation.

We have used a mix of research methods, qualitative and quantitative, for this exploratory design, “as this approach contributes to drawn interpretation based on the strength of both data sets to understand the research problem” (Cresswell, 2014, p. 6). By using these methods, we can see emerging trends between variables, which shed light on patterns related to collaborations, research subjects and topics, types of interventions and more, giving us clues on how meanings are formed and transformed within the field.

The framework used is based on Bourdieu's concept of social structure and epistemological surveillance. As this author proposes that dominant groups use their power to shape and control the production and dissemination of knowledge. The epistemological surveillance contributes to overlooking how the field of women in STEAM is studied, as it questions social knowledge production. Bourdieu claimed that by not applying the instruments of knowledge towards the comprehension of the scientific practices and conditions, we develop a disposition to portray and explain the social without understanding the structures and power relations that interplay between the knowing and the knower subject. Therefore, disregarding the performativity theory (Bourdieu, 1977; 1993).

3. RESULTS

Results indicate that 30% of the publications on women in STEAM were produced from 2008 to 2015, compared to 70% that took place from 2016 to 2020, as in Table 1, advising us on an evolving trend to grasp the subject within different areas of STEAM.

Universities' collaboration framework results are impacted by country collaboration. Only 26% of research is from countries such as Japan, Spain, the UK, Nigeria, and Australia, against 73,9% produced by U.S. Universities. Topics vary from country to country, for example, information and communications technology to understand gender diversity in STEAM in Spain (Botella et al., 2019); Gender disparities in the UK in research publishing system, comparing fields and methods (Thelwall et al., 2020); Gender balance in the European Research Council Grants (Bautista-Puig et al., 2019), or the efforts needed to improve Japanese women's status in STEAM (Souma, 2019).

Considering the Sample Unit, 28 articles are from the same University or Institution, indicating a 39% of collaboration rate. This is not surprising as most samples are from U.S. Institutions, informing about their strategic alliances within the country. Related to this subcategory, gender imbalances were found in authorship, with 74% of research papers written by women. This evidence shows that with the involvement of more men in the gender arena across disciplines, the more rigid paradigms feminist agenda can break; for that, scholarly literature using epistemological surveillance is critical.

Correspondence in authorships reflects the gender variable, not addressing the intersectionality based on nationality, gender identity, sexual expressions, and more, which can perpetuate inequalities. On the other hand, combined gender and authorship data revealed that women collaborate more frequently than men, with a 93% collaboration rate for up to three authors. Men collaborate at a rate of 67% for one or up to four authors. Nevertheless, journal conditions and the scientific tradition in the fields may influence these collaborations.

Table 1

Relationship of Journals, number of publications, and countries.

Country	Journal	Year (s)	Results
U.S.	Administrative issues Journal	2020	1

Australia	Australian Journal of Forensic Sciences	2019	1
U.S.	Collegiate Aviation Review International	2019	1
U.S.	Educational Psychology Review	2017	1
Spain	Entropy	2019	1
U.S.	Gender Work Organ	2019, 2018, 2017	3
U.S.	Gender Issues	2018, 2019	2
U.S.	Gender and Education	2019	1
Lithuania	Gender Studies & Research	No date	1
UK	Geophysical research abstracts	2019	1
Sweden	Island Studies Journal	2018	1
U.S.	Journal STEM Education	2020	1
U.S.	Journal of Comparative Family Studies	No date	1
U.S.	The Journal of Higher Education	2017, 2019	2
U.S.	Journal of Social Issues	2011, 2011	2
U.S.	Lucerna	No date	1
Czech Republic	Marketing and Management of Innovations	2020	1
U.S.	Mathematical Intelligencer	2012	1
Nigeria	Matatu: Journal of African Culture & Society	2016	1
U.S.	Peer Reviewed Association of American Colleges & Universities	2019	1
U.S.	Perspectives on Science and Christian Faith	2015	1
U.S.	Psychological Inquiry	2011	1
U.S.	PloS ONE	2016 (2), 2020 (2), 2021	5
UK	Profesional de la información, EPI SCP	2020	1
Japan	Pure & Applied Chemistry	2019	1
U.S.	Review of Policy Research	2010	1
U.S.	Review of Social Economy	2014	1
Spain	Research Evaluation	2019	1
U.S.	Research in Higher Education, Springer	2008	1
U.S.	Self & Identity	2020	1
U.S.	Science Mag Org	2016, 2015 (2)	3
U.S.	Social Forces	2020	1
U.S.	Social Science Quarterly	2011	1
U.S.	Studies in Higher Education	2014	1
U.S.	The Career Development Quarterly	2014	1
Total			46

Note. Author's own elaboration

Table 1 highlights important journals and topics in the STEAM field based on a sample of 46 papers. The most prominent journals were PloS ONE, Science Mag Org, and Gender Work

Organ. At the same time, the most common topics were STEAM (63%), STEAM education (11%), research (9%), and a mix of forensic, aviation, technology, and information and computer sciences (13%). However, the arts field needs to be better represented. The STEAM topics most analysed included research collaboration, inequalities, career pathways, romantic relationships, culture, bachelor pathways, sociocultural contexts, ethnic disparities, and a few more.

This analysis highlights frequent keywords such as academia, gender, women, gender inequality, STEAM fields, gender gap, gender diversity, academic careers, research, women in science, stereotypes, and institutional change.

Later, we categorised the SU by leading verbs, resulting in a mix of the goals pursued by explaining (41%), describing (39%), evaluating (15%), and intervening articles (4%). However, the descriptors covered various topics, making it difficult to determine the scope of the studies.

Results indicate that academics are interested in 1) Corroborating gender inequalities in STEAM, 2) Exploring women's interest in STEAM careers, 3) Addressing challenges and opportunities for women in research, 4) Understanding career development in STEAM, 5) Conducting cognitive studies on biological differences and 6) motherhood and work-life balance. Hence, these studies rely on national and institutional data to understand by far population groups and online audiences.

Following this logic, some examples are 20 longitudinal studies on high school science or engineering experience boost women's confidence to pursue this as future careers (Hunt et al., 2021), comparing first-time expectant mothers' decisions in central Texas to those of women in Great Britain and Spain, this study tests Hakim's preference theory (Stanley-Stevens et al., 2011), cooperative and competitive decision factors that influence in the STEAM courses (Post et al., 2020).

Academics primarily conduct programmed (41%) and documental research (35%), focusing on private and public agendas. Most of the research scenarios identified were offline as organisational (17%), group (22%), interpersonal (13%), and conventional masses (4%); on the contrary, online methods used were online interpersonal (2%), groups (11%), organisation (11%), masses (20%), as in Figure 1. These methods target specific populations with ethnic or institutional differentiations, accentuating their interest in responding to particular concerns.

Standard data collection and predominant techniques used in these studies include documental analysis in a total of 21 articles (46%), a total of 17 surveys (37%), and a total of 6 conversational and experimental methods (13%). In this order of ideas, the dominant techniques are content analysis, with 27 of the results (59%), and documental analysis, 13 of the results (28%), followed by other techniques (13%).

Academics have made valuable contributions to the study of women's representation in STEAM fields. Research has covered various topics, including the extent of gender inequality, factors influencing women's interest in pursuing STEAM careers, challenges and opportunities faced by women in research, career development challenges, and the impact of motherhood on work-life balance.

Although, there is a proven commitment to understanding and addressing women's representation in STEAM using a range of research techniques and methods to explore this issue. There is a predominant trend to use descriptive research instead of more research-action-participation applied to different contexts to encourage the social change that enables all women to have a space and lead in STEAM in this new century.

4. DISCUSSIONS AND CONCLUSIONS

From 2000 to 2020, there has been an increasing social awareness about women in STEAM, although there is more to advance in the field, according to the academic discourse analysed.

Gender studies are intrinsically linked to social change, structures, and agency, providing insights into complex decision-making processes influenced by emotional and cultural factors and institutional constraints (UNICEF, 2012; Leyton, 2014). The intersectionality factor lacking in the articles analysed is a critical feature that can significantly contribute to future academic narratives. The gender mainstream and intersectional approach facilitate a deeper understanding of the realities diverse women face in different contexts, including female presence in STEAM.

However, the subject of study in the sample is predominantly Western-focused, and therefore, we encourage north-south cooperation between universities worldwide. Such collaboration can enable knowledge transfer and motivate sharing of best practices, if necessary, to analyse scientific discourse about women in STEAM fields.

The role that Arts and Humanities play in the STEAM fields needs to be encouraged. The integration of Arts in such fields of Science and Engineering can uncover new perspectives that foster innovation and creativity among institutions and contribute to enhancing learning experiences and career fields, with ethical considerations as required.

While scientific programs and research are essential, more is needed to drive social transformation. As such, scientific discourse could give more protagonism to research-action-participation interventions to address more than just descriptions of women's roles in STEAM. In addition, the academic community should move forward to scalable and adaptable strategies for implementing changes in the social structure across different contexts.

5. REFERENCES

- Bautista-Puig, N.; García-Zorita, C., Mauleón, E. (2019). European Research Council: excellence and leadership over time from a gender perspective. *Research Evaluation Journal*, Vol. 28, 370-382. <https://doi.org/10.1093/reseaval/rvz023>
- Blessinger, K., & Olle, M. (2003). Content analysis of the leading general academic databases. *Library Collections, Acquisitions, and Technical Services*, 28 (3), 335-346. <https://doi.org/10.1016/j.lcats.2004.05.001>

- Bourdieu, P., Chamboredon, J.C., Passeron, J.C. (1991). *The Craft of Sociology*. Walter de Gruyter. Berlín, English Ed. ISBN: 0-89925-870-0
- Bourdieu, P. (1977). *Outline of a Theory of Practice*. Cambridge: Cambridge University Press.
- Bourdieu, P. (1993). *The Logic of Practice*. Cambridge: Polity Press.
- Botella, C., Rueda, S., López-Iñesta, E., Marzal, P. (2019). Gender Diversity in STEM Disciplines: A Multiple Factor Problem. *Entropy Journal*, Vol. 21, 1-30. <https://doi.org/10.3390/e21010030>
- Campopiano, G.; Gabaldón, P.; Gimenez-Jimenez, D. (2022). Women Directors and Corporate Social Performance: An Integrative Review of the Literature and a Future Research Agenda. *Journal of Business Ethics*, Vol. 182, 717-746. <https://doi.org/10.1007/s10551-021-04999-7>
- Caprile, M.; Palmén, R; Sanz, P; Dente, G. (2015). Encouraging STEM studies—Labour Market Situation and Comparison of Practices Targeted at Young People in Different Member States. *European Parliament, DG for Internal Policies. Policy Department A*. Available online: [https://www.europarl.europa.eu/RegData/etudes/STUD/2015/542199/IPOL_STU\(2015\)542199_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/STUD/2015/542199/IPOL_STU(2015)542199_EN.pdf)
- Cardella GM, Hernández-Sánchez BR and Sánchez-García JC. (2020) Women Entrepreneurship: A Systematic Review to Outline the Boundaries of Scientific Literature. *Front. Psychology*. 11:1557. <https://doi.org/10.3389/fpsyg.2020.01557>
- Cresswell, J. W. (2014). *A Concise Introduction to Mixed Methods Research*. Sage Publications, p. 1-152. ISBN 9781483359052
- Connell, R. (1993). *Schools & Social Justice*. (Ed.). Our schools, ourselves, 12. James Lorimer & Company. UPCC book collections on Project MUSE: Archive Political Science and Policy Studies Foundation. ISBN: 9781566391375.
- Dunlap, S., Barth, J. M., Chappetta, K. (2019) Gender Roles in the Romantic Relationships of Women in STEM and Female-Dominated Majors: A Study of Heterosexual Couples. *Gender Issues*, Vol. 36, 113-135. <https://doi.org/10.1007/S12147-018-9223-3>
- EBSCO (2023). About Academic Search Ultimate database. EBSCO Information Services. Available online: www.ebsco.com
- European Commission (2005). Commission Staff Working Document “Women and Science: Excellence and Innovation-Gender Equality in Science”- SEC 370. Available online: <https://data.consilium.europa.eu/doc/document/ST-7322-2005-INIT/en/pdf>
- Halleran, M. S. (2019). Gender Balance in Aviation. *Collegiate Aviation Review International*, Vol. 3 (1), 8. Available online: <http://ojs.library.okstate.edu/osu/index.php/CARI/article/view/7821/7216>
- Hill, T.; Rogers, E. (2012) Gender Gaps in Science: The Creativity Factor. *Springer Science+Business Media LLC*, Vol.34, No. 2, p. 19-25. <https://doi.org/10.1007/s00283-012-9297-9>

- Hunt, P., Dong, M., Miller, C. (2021). A multi-year science research or engineering experience in high school gives women the confidence to continue in the STEM pipeline or seek advancement in other fields: a 20-year longitudinal study. *PloS ONE*, Vol. 16 (11). <https://doi.org/10.1371/journal.pone.0258717>
- Kuschel, K., Ettl, K., Diaz-García, C., Alsos, G. A. (2020). Stemming the gender gap in STEM entrepreneurship— insights into women’s entrepreneurship in science, technology, engineering, and mathematics. *International Entrepreneurship and Management Journal*, Vol. 16: 1-15. <https://doi.org/10.1007/s11365-020-00642-5>
- Leyton, D. (2014). Social structure, its epistemological uses, and the construction of the subject in Bourdieu’s sociology. *Universum. Revista de Humanidades y Ciencias Sociales* vol. 29 (2), 169-183. Available online: <http://www.redalyc.org/articulo.oa?id=65032873012>
- Maeda, J. (2012). STEM to STEAM: Art in K-12 is essential to building a strong economy. *Edutopia: What works in education*. Available online: <http://www.edutopia.org/blog/stem-to-steamstrengthenseconomy-john-maeda>
- Mejias, E. A.; Thompson, N.; Sedas, M. R.; Rosin, M.; Soep, E.; Peppler, K.; Roche, J.; Wong, J.; Hurley, M.; Bell, P.; Bevan, B. (2020). The trouble with STEAM and why we use it anyway. *Science Education*, 210-231. <https://doi.org/10.1002/sce.21605>
- Ming-Te, W.; Degol, J.L. (2017). Gender Gap in Science, Technology, Engineering, and Mathematics (STEM): Current Knowledge, Implications for Practice, Policy and Future Directions. *Education Psychology Review*, 29: 119-140. <https://doi.org/10.1007/s10648-015-9355-x>
- Panagiota, F.; Papageorgiou, Y.; Petousi, V. (2019). Women are needed in STEM: European policies and incentives. *Communications of the ACM*, Vol. 6, No. 4. Available online: <https://www.researchgate.net/publication/331947791>
- Perignat, E., Katz-Buonincontro, J. (2019). STEAM in practice and research: An integrative literature review. *Thinking Skills and Creativity*, Vol.31, 31-43. <https://doi.org/10.1016/j.tsc.2018.10.002>
- Post, M., Bates, K., Scharff, L. (2020). Factors Influencing Cooperative and Competitive Decisions in STEM Courses. *Journal of STEM education: Innovations and Research*, Vol.21, 21-40.
- Root-Bernstein, R. (2015). Arts and crafts as adjuncts to STEM education to foster creativity in gifted and talented students. *Asia Pacific Education Review*, Vol. 16 (2), 203–212. <https://doi.org/10.1007/s12564-015-9362-0>
- Rübsamen- Waigmann, Helga et al. (2003), Women in industrial research: A wake-up call for European industry, Office for Official Publications of the European Communities, Luxembourg. Available online: http://www.genderportal.eu/sites/default/files/resource_pool/KINA20814ENC_002.pdf

- Sattari, N., Sandefur, R. (2017). Gender in academic STEM: A focus on men faculty. *Gender Work Organ*, Vol. 26, 158-179. <https://doi.org/10.1111/gwao.12249>
- Stanley-Stevens, L., Kaiser, K. (2011). Decisions of First Time Expectant Mothers in Central Texas Compared to Women in Great Britain and Spain: Testing Hakim's Preference Theory. *Journal of Comparative Family Studies*, (1), 113-130. <https://doi.org/10.3138/jcfs.42.1.113>
- Souma, Y. (2019). Efforts to improve Japanese women's status in STEM fields. *Pure & Applied Chemistry De Gruyter*, Vol. 91 (4): 733-741. <https://doi.org/10.1515/pac-2018-0903>
- Thelwall, M., Mahshid, A., Lebidziewicz, A., Bailey, C. (2020). Gender disparities in UK research publishing: Differences between fields, methods, and topics. *Profesional de la información*, Vol. 29(4), e290415. <https://doi.org/10.3145/epi.2020.jul.15>
- UNICEF. (2012). Communication for development Available online: www.unicef.org/cbsc/index_42352.html
- UNESCO. (2019). Cracking the code: education of girls and women in Science (STEM). Available online: <https://unesdoc.unesco.org/ark:/48223/pf0000253479>
- UNESCO (2016) Executive Board Decisions Adopted at its 199th Session. Paris, May 16th of, 2016. Available online: <https://unesdoc.unesco.org/>
- UNDP. (2021) "COVID-19 and Gender Equality: A Call to Action for the Private Sector". Available online: <https://www.weps.org/resource/covid-19>
- Uhly, K. Visser, L. & Zippel, K. (2017) Gendered patterns in international research collaborations in academia. *Studies in Higher Education*, Vol. 42 (4), 760-782. <https://doi.org/10.1080/03075079.2015.1072151>
- Ward, J., Johnson, R., Wilson-Wilde, L. (2019). Gender equity: how do the forensic sciences fare? *Australian Journal of Forensic Sciences*, Vol. 51:sup1, S263-S267. <https://doi.org/10.1080/00450618.2019.1568556>
- Zippel, Kathrin (2017) Gendered images of international research collaboration. *Gender Work Organ*, Vol.26, 1794-1805. <https://doi.org/10.1111/gwao.12233>

ISBN: 978-84-1170-557-8

Dykinson, S.L.

Publication 2

8.2. “EU Projects on Women in STEAM Sectors: Assessing Gender Gap in Science”

“EU PROJECTS ON WOMEN IN STEAM SECTORS: ASSESSING GENDER GAP IN SCIENCE”

TATIANA BUELVAS-BALDIRIS
King Juan Carlos University, Madrid, Spain
RAINER RUBIRA-GARCÍA
King Juan Carlos University, Madrid, Spain
RASA POCEVICIENÉ
Siauliai Valstybine Kolegija, Siauliai, Lithuania

1. INTRODUCTION

Covid-19 has increased the urge to work around women in STEAM globally. However, European countries face an unprecedented shortage of women in the fields. “Women make up 52% of the European population, and the majority of tertiary graduates in the EU, yet only 2 out of 5 scientists and engineers are women and only 18% of the specialist in ICT” (European Commission, 2022, p. 2), not to mention other STEAM professions. The characteristic of this new economy requires new skills and technical knowledge to ensure that all EU citizens can access opportunities that boost their careers and life plan.

A recent study from the European Institute of Gender Equality (EIGE) analyzed the economic benefits of gender equality applied to STEAM education considering the fields of computing and engineering, results state that “more gender equality would lead to between 6.3 million and 10.5 million additional jobs in 2050, with about 70% of these jobs taken by women [...]; an increase in GDP per capita of up to nearly 10% in 2050” (2017, p. 4). Accordingly, in 2022 the European Parliament and the Council prepared a proposal to declare 2023 the “Year of Skills”, to mitigate that “77% of the companies struggled to find employees with the required skills” (European Commission, 2022, p. 1). The shortage of skilled staff and experienced managers can be solved with upskilling and reskilling education.

Although the EU has a strong policy and legal approach that is considered in many of their laws, programs, and projects, conquering small steps in different areas within gender equality, a few of them: the Treaty of Rome (1957); the Treaty of Maastricht (1992); Treaty of Amsterdam (1997); The Charter of Fundamental Rights of the EU (2000); The Treaty of Lisbon (2007), among others to which nations have to abide on (García M., 2022, pp. 461-462). Gender experts have analyzed that “equal treatment does not necessarily lead to an equal outcome” (EIGE, 2022, p. 7). For this reason, the treaties, along with other supranational measures, national laws, and agreements on social policy, are to strengthen the role of the EU.

Women in STEAM challenges are addressed with a budget package supported by the European Social Fund Plus (ESF+), and its instruments that manage 99 billion euros for the 2021-2027 plan (European Commission, 2022, p. 5). The institutions that invest in their focal programs are The InvestEU program, the European Regional Development Fund (ERDF), The Just Transition Fund (JTF), the European Solidarity Corps, Erasmus+, Horizon Europe, the Digital Europe Program, Development, and International Cooperation Instrument (NDICI), among others. Projects to promote women in STEAM are planned and executed from some of these funds.

Europe has funded projects focused on the gender gap and some to STEAM in programmes such as Programme 7 (2007-2013), Horizon 2020 (2014-2020), and other programmes on education like the Lifelong Learning Programme (2007-2013), and Erasmus+ (2014-2020) (García Holgado et al., 2019). Yet, little research has been conducted to analyze proposals and achievements of such projects and the STEAM fields are “continuously permeated by substantial and persistent gender disparities, as a voluminous body of evidence and scholarship demonstrates” (Anagnostou, 2022, p. 74).

For this reason, we have decided to analyze the trends, proposals, and outcomes in projects that seek to promote women and girls in STEAM in Europe. We could conduct an SRPR of EU-funded projects from 2019 until 2023 or above. Through this SRPR, trends, and observations are made for future projects to be scalable to other contexts and analyze further challenges and advancements in the area.

The paper has been divided into 4 sections. The first section is background research on the topic, plus the theoretical framework. The second section describes an updated context on Women in STEAM participation from North to South European countries. Third section method and sample for the SRPR applied. Finally, the last section summarizes this work's main results and conclusions.

1.1. Previous Work-Related and Theoretical Framework

The present section analyzes current studies and former literature reviews that are close to the objective of mapping European projects that promote women in STEAM in Europe. After surfing different databases such as Web of Science (WoS) and search engines such as Google and Google Scholar, using the keywords: Gender gap; women OR woman; systematic literature review; mapping study; European projects; STEM and STEAM.

These were some of the results: A systematic literature review on gender gap in higher STEM studies (Verdugo Castro et al. 2022); Economic benefits of gender equality in the EU (EIGE 2017); A mapping study on technology, gender, and organizations on tech companies (Valdés et al. 2022); Women's entrepreneurship in STEAM fields (Poggesi et al. 2020) and, Gender pay gap and the factors to predict it (Bishu and Alkadry 2016); A Nordic review on gender equality in academic careers (Silander et al. 2022); A mapping study on gender equality in tech entrepreneurship (Wiken Wilson and Patón-Romero 2022), and A review on gender gap in science and the research agenda (Tomassini 2021).

Nevertheless, only (3) articles are the starting point of this research: European Proposals to Work in the Gender Gap in STEM: A Systematic Analysis (García-Holgado et al. 2020A), and Guidelines for Performing Systematic Research Project Reviews (SRPR) (García-Holgado et al. 2020B), and Trends in studies developed in Europe focused on the gender gap in STEM (García-Holgado et al., 2019).

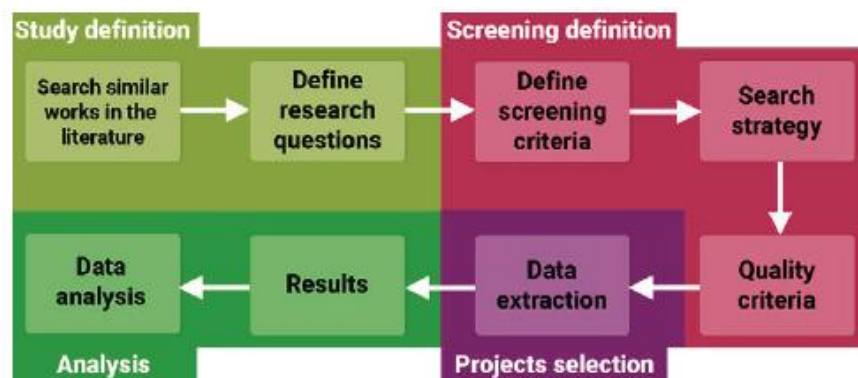
Over the past decade, the EU has developed uncountable projects promoting women's STEAM participation. However, “there is not an existing methodology to carry

out a systematic analysis research for projects” (García Holgado et al., 2020B, p. 2), and the main problem identified by the previous authors is that projects are different from the literature in their content, as they do not follow the structure nor funding calls. Scientific literature can be found in scientific databases. Still, there is no accessible database that collects European projects and their results (García-Holgado et al. 2020A, p.2).

A Systematic Literature Review (SLR) is a type of review that collects and critically analyses several research works through a systematic process (Kitchenham, 2004; Keele, 2007). The SLR aims to evaluate and interpret all data relevant to a particular research question using a reliable, meticulous, and auditable methodology (Kitchenham, 2004; Keele, 2007; Kitchenham et al., 2009). Nevertheless, the principal European databases hold information on over 20.000 projects from different topics. Consequently, the methodology used is the Systematic Research Projects Review (SRPR), previously tested by (García-Holgado et al., 2019), adjusting some of the research questions with a different time frame for projects from 2019 until 2023 or above. This background study analyzed projects on the same topic from 2014 to those ending in 2019.

The SRPR adapts Kitchenham’s SLR and Petersen’s proposal to conduct systematic mapping studies (Petersen et al., 2008; Petersen et al., 2015). Considering the great number of projects produced annually, the SRPR presents a solution to analyze a set of projects fulfilling a particular criterion (García-Holgado et al., 2020B). This SRPR does not seek to reinvent protocols for an SLR but rather to adapt them to analyze the resources that make part of a research project. This method is composed of the steps in Figure 1.

FIGURE 1. Definition and implementation phases of the SRPR method



Source: (García-Holgado et al., 2020B).

The main results in the European Proposals to Work in the Gender Gap in STEM: A Systematic Analysis study show that most projects belong to Horizon and Erasmus+ programme; some acronyms are ReadySTEMgo, ROSA, STING, Mind the GAP!, EGERA, PLOTINA, and Baltic Gender, among others (García-Holgado et al., 2020A, p.6), for a total of 31 projects analyzed. Depending on the project objectives established, 74% were interventions, 22.58% were diagnosis and intervention, and 3,23% were only diagnoses. As projects have different expected outputs, the most

frequently found were toolkits (10), best practices (9), educational material (6), and gender equality plans (5) (p. 7). The main conclusions reached intended more scientific rigor by establishing a diagnosis before an intervention. At the same time, through projects, different measures are applied to achieve different styles of results, enriching the field at a scientific level, and generating a more significant impact.

The results of the study Trends in studies developed in Europe focused on the gender gap in STEM show that most projects center on STEM or STEAM subjects (6), STEM careers (4), STEM jobs or entrepreneurship (4), different technologies such as robotics or IoT (3), or research context (4) [5]. Regarding the participating countries, 32 were from European countries such as Italy, Spain, the UK, and Germany; Latin American countries such as Chile, Colombia, Costa Rica, and more.

Nevertheless, most of the projects were coordinated by Spanish institutions (22,58%), and several institutions are involved in more than one project. Most of the projects were developed in 2016 (10), and the EC spent over 30.825.921,54 euros on the gender gap in STEAM from 2014-2018 (p. 6). The conclusions reached inform about toolkits, good practices, frameworks, and guidelines that can be used in different contexts; also, the mapping study provides information on the countries working actively on this topic, such as Spain, UK, Italy, and Germany.

In previous studies about EU projects to promote STEAM, information is centered on the type of outcomes and countries that collaborated, among others. Nevertheless, for instance, why are those projects necessary? And what are some of the issues that the EC is trying to tackle with them?

Some authors claim women tend to choose a career related to people, their care, and education, whereas men opt for fields of things (Guo et al., 2018). Yet, authors such as (Stephen et al., 2014) explained that to combat the gender gap, different social and cultural factors require special attention to solid environmental influences to be reaffirmed, also, contextual factors that can be modulated. Accordingly, there are other reasons women do not participate in STEAM fields, such as the Stereotype Threat, leaky pipeline, and more.

The stereotype threat refers to the fear of confirming negative stereotypes about one's group; in the STEAM field, it relates to the fact that traditionally these fields are associated with men. Therefore, women may fear rejection and experience this phenomenon, which can cause stereotypical thoughts undermining their confidence, even when having high-performance results (Cheryan et al., 2017). On the other hand, as described Blickenstaff, "The pipeline leaks students at various stages: students who express interest in science careers sometimes change their minds when applying to colleges and universities and select other areas of study. Others begin their post-secondary education in a STEAM program but change majors before graduation. Finally, some students leave the pipeline after graduation, the majority of them being females" (2005, p. 369). Hence, evidence supports the existence of widespread horizontal gender segregation in tertiary education (Verdugo-Castro et al., 2022).

Moreover, the science agenda and gender have three critical rationales "the horizontal segregation or underrepresentation of women in specific scientific fields; The vertical segregation or the difficulties to advance through the academic path's

levels and lastly, the glass ceiling or limited access to leadership positions in the stratification of science” (Tomassini, 2021, p. 2). The three have roots on the grounds of the sexual division of labor, creating significant gender disparities in science at all levels.

One of the many reasons authors have acknowledged for gender inequalities is the principle of cumulative advantages which refers “to various complexities that forge women into a major path for getting access to leadership positions” (Tomassini, 2021, p. 3). Following, other authors have applied this concept to gender and called it “the Matilda effect” (Rossiter, 1993). By recognizing these issues by their name and root, it is possible to translate them later into inputs that can be considered for policies, programmes, and projects that address the glass ceiling and horizontal and vertical segregation in EU projects on STEAM fields.

1.2. EU gender mainstream & social policy context

132 years will be needed to reach full gender parity across the globe, this conclusion has been reached after the Global Gender Gap Report (GGGR) evaluated the current state and evolution of gender parity across economic participation and opportunities, educational attainment, health, and survival, and political empowerment in 146 nations. In 2022, gender disparities closed by 68% (WEF, 2022, p. 5).

In Europe, among the 10 top performers are Iceland (90.8%), Finland (86%), Norway (84.5%), and Lithuania (79.0%), as described in the 2022 GGGR. From South-European countries, Spain (78.8%), Austria (78.1%), Portugal (76%), and Italy (72%). The GGGR report states that “most countries (30 of 35) from Europe are on the verge of closing their gender gaps in the share of women in technical roles, with a 99% [...], 22 of the 35 countries have closed at least 80% of their gender gap in labor-force participation rate” (2022, p.20). Nevertheless, contrasting this data with the EU Commission’s background information in official public records seems inconsistent, as women’s participation in STEAM is still an ongoing problem (European Commission, 2022, p. 2-4).

Despite all efforts made by the EU institutions and corporations, the outcome still is not the one desired. Europe has been experiencing fragmentation in rules and initiatives in favor of gender equality common among supranational, national support structures and stakeholders (Navarro-Sanz & Sanz-Gómez, 2021), leading to a lack of consistency or harmonization in policies and practices across Europe. Given European organizations’ design complexity, securing a common agenda is not yet viable. EU institutions have mixed approaches to gender equality, “making it more difficult to reach an agreement on how to assess the EU preferences” (Vleuten, 2007, p. 11).

Nevertheless, the EU prioritizes equal opportunities in its policies, leading to the use of gender equality as a means for boosting competitiveness in the workforce and positioning the EU as a top economy; this aim on competitiveness and innovation often disregards the impact on individuals as it aligns with neoliberal values (García M., 2022).

The problems are more extensive as the potential for a successful gender mainstream approach is not achieved considering the technocratic nature of the EU policies (Vida, 2021). In turn, “this becomes a case of what authors have called the paradigmatic case of social policy in Europe, where it is proven there is no shared responsibility on this topic among nations” (García M., 2022, p. 465) as they attend to supranational policies in a differentiated way. Appealing to Rawls’s theories, “There is a division of labor in society. Individuals are responsible for their choices and the definition of their ends, yet society must assure basic freedoms, fair equality of opportunity [...] between all members” (Rawls, 1999, pp. 360-362), considering the digital transformation of the EU economies and the structural gender barriers in STEAM, a fair society seems mandatory.

2. METHOD AND SAMPLE

The method used is the SRPR explained in brief before. We have used the study (García-Holgado et al., 2019; García-Holgado et al., 2020A; García-Holgado et al., 2020B) as our guideline to establish a systematic process for analyzing the project sample. The SRPR can be used to “identify trends in research projects; identify lacks to define new research projects; to justify the innovation of new research projects proposal; to collect valuable results that apply to another context” (García-Holgado et al., 2019, p. 139), as explained in this study.

Before carrying out the SRPR, we conducted scientific literature or project revision to ensure this study was necessary; such results have been exposed in the 1.1 section. Considering the previous and our main objective, our research questions are defined as follows:

RQ1: What are the trends in Europe in the study about the gender gap or/and women in STEAM?

RQ2: Which kind of solutions or initiatives are developed?

RQ3: Which kind of outcomes are developed?

RQ4: How much money was invested in these projects, and in which year?

RQ5: Which countries participated in this project?

RQ6: What type of institutions developed these projects?

RQ7: What are the target groups?

Consistently with those questions, the scope of the revision was defined using (Petticrew et al., 2005):

Population (P): European research projects focused on the gender gap or/and women in STEAM.

Intervention (I): Conduct an SRPR of European projects focused on the gender gap or/and women in STEAM.

Comparison (C): No comparison is needed.

Outputs (O): An overview of advancements and challenges about the gender gap or/and women in STEAM

Context (C): Educational and professional sector in STEAM.

Regarding the inclusion, exclusion, and quality criteria listed below:

1. The project focuses on promoting the participation of women in STEAM or STEM/ or the gender gap in STEAM or STEM in Europe AND
2. The project has started in the last four years (2019-2023) AND
3. The project is available in the most relevant databases supported by the European Union AND
4. The information about the project is available in English or Spanish
5. Exclusion criteria is about the negative form of this inclusion criteria.

The quality criteria ensure that the results answer to such the RQ, and they are a set of meta-questions in which to filter the projects:

- The website of the project is available?
- The outputs of the project are available?
- Is there more information in English or Spanish available about the project than the project summary?
- Are there scientific publications associated with the project?
- Does the main focus of the project on the gender gap or/and specifically on women in STEAM?
- Was the study carried out in different countries?
- Does the project carry out any evaluation process focused on the gender gap?
- Does the project provide a STEM-focused product (toolkit, framework, materials)?
- Does the project's activity continue (or is planned to continue) after the funding period?

2.1. Sources and Sample

European projects are developed at different levels depending on the institutions and the funds. Nevertheless, we focus on cross-border and international projects to maintain the rigour of updating data according to the background study (García-Holgado et al., 2019; García-Holgado et al., 2020A; García-Holgado et al., 2020B); also, these are the only projects that can be found available in Spanish and/or English. Accordingly, the databases have been chosen with the same requirements as mentioned in the background study. The main databases used are Community Research and Development Service (CORDIS), which is used to disseminate EU-funded research and projects from 1990 until today (<https://cordis.europa.eu/projects/>); Erasmus+ Project Results Platform covers projects results since 2007 (<https://erasmus-plus.ec.europa.eu/es/projects/search/>); and Keep database (<https://keep.eu/projects/>) that covers cross-border projects.

The main terms search used: “gender”, “gender gap”, “women”, “STEAM”, “STEM”, “science, technology, engineering and mathematics”, and “diversity”. Although, depending on the database, the search string changed to adapt to each search engine, for example:

Erasmus+: (“gender gap”, “gender”, “women”, “STEM”), for the time period 21/20/2019. For the database Keep: (“gender gap” OR “gender” OR “women” OR

“woman” OR “diversity”) was combined with one from (“STEAM” OR “science, technology, engineering and mathematics”).

The data collection was on an Excel spreadsheet adapted to each database, as to download in text format, each database has its own parameters. All results were organised and coded manually. The results are as follows:

Table 1. Results per database and filtered with selection and quality criteria.

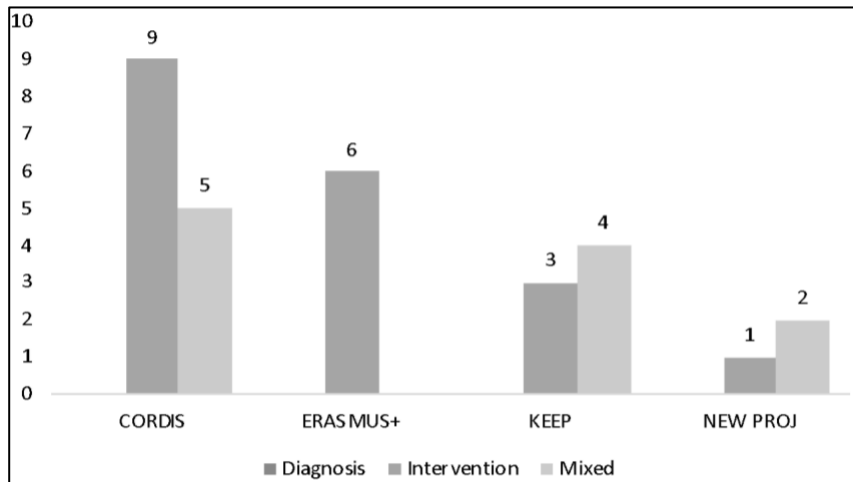
<i>Phase 1</i>	
Database	No. Projects
Cordis	331
Erasmus	31
Keep	129
Total projects	491
<i>Phase 2</i>	
Cordis	331
Erasmus	31
Keep	129
New projects	34
Total projects	525
Duplicates	-14
Total projects	511
<i>Phase 3 & 4</i>	
Cordis	269
Erasmus	31
Keep	129
New projects ¹	20
Out of date-excluded	-62
Total projects	511
Minus excluded projects	449
Projects Excluded	419
Projects that passed QT	30

¹ New project (s) were identified through other projects’ websites and info.
Source: Authors’ own elaboration

A total of 449 projects were analysed through the quality criteria (followed the same structure as the research questions), giving us a final result of 30 curated projects that are related to the gender gap or/and women in STEAM. We followed the

Independently from the database taken, 37% of the projects analysed used a mixed structure where first, some assessment tools and diagnosis took place to develop the activities. However, none of the projects was only for diagnosis.

GRAPHIC 1. Database disaggregated data on the type of interventions performed.



Source: Authors' own elaboration

As seen in Graphic 1, in contrast, 63% of the projects were identified as interventions as they meant to audit or create tools to measure the impact on initiatives pursued, such as how well did perform a GEP used in a Research Performance Organization RPO; in fact, some of them were in a mature phase which explains why only intervention was used, i.e., Scientix 4, which had already completed the 3rd version.

3.3. RQ3: Which kind of outcomes are developed?

Most projects n=30 from CORDIS, ERASMUS+, and KEEP provided various outcome types. The most frequently found are good practices (30%); toolkits or educational materials (33%); frameworks for assessment, online courses such as MOOCs, training, and fellows (13%); online platforms for courses and networking (13%); policy recommendations and GEP (10%), among others.

A few of the outcomes are a gender-sensitive methodology trainee guide (Manchenko et al., 2022); A study on how mentoring, work-life balance, and other factors affect female researchers' careers in Slovenian RPOs (Petrovic, 2021); A guide on Gender Dimension in Teaching (Peña et al. 2021); Innovation and Gender in STEAM (Jiménez-Iglesias et al., 2018), Challenging Gender Inequality in Smart Mobility (Woodcock et al. ,2020), and more.

It is relevant to mention that depending on the database, some documents were accessible as in CORDIS. Nevertheless, the records for ERASMUS+ and KEEP databases are not necessarily open to the public, which can affect the scalability of

projects, as such materials can be used, if not adapted, to different contexts with the same problems.

Considering the proposals and the problems they are intended to solve, it was hard to find a clear structure of KPIs to measure impact in most projects, even though a great variety of information is displayed. Additionally, most projects lack a plan for future actions that can make them sustainable after the funding period has ended.

3.4. RQ4: How much money was invested in these projects, and in which year?

In CORDIS database, most of the projects financed were through the programme H22020-EU.5. – Science with and for Society, and H2020-EU.5.b. - Promote gender equality in particular by supporting structural change in the organisation of research institutions, under the actions of SwafS-26-2020 - Innovators of the future: bridging the gender gap, among others. The total investment for 14 projects was 34.856.735,88 €.

ERASMUS and KEEP project budgets are smaller in comparison. Only 13 projects were funded with a total budget of 1.438.345,50 € and 13.815.447,56 €, respectively. The programmes used refer to social inclusion, cooperation for innovation, and the exchange of good practices.

The new projects found via other's project main page belong to HORIZON and were located through CORDIS; these 3 projects had a total investment of 7.875.089,75 €. In total, 18 projects were funded from 2017-2019 and 12 from 2020-2021, most of them are still ongoing, and the total investment done by the EU Commission to promote the further participation and joined of women in STEAM is 57.985.618,69 € across European countries.

3.5. RQ5: Which countries participated in these projects?

The projects have been implemented in the participant's countries, and a coordinator is assigned from the same group. Not all projects are executed only in Europe; countries like Jordan, Tunisia, Palestine, and Israel are also present in some of the KEEP projects working around entrepreneurship areas in STEAM alongside EU partners.

The countries that have managed or coordinated the most are Spain (20%), 6 projects, and Italy (27%), 7 projects. In contrast, the rest of the projects have been coordinated by countries like Denmark (1), Austria (1), Norway (1), Estonia (1), Cyprus (1), and more.

Despite the origin of the coordinator's organisation, it appears to be more than 1 institution from the same country, which can be due to the particular interests of institutions. Nevertheless, the countries with more participation are Spain, Italy, Portugal, France, Germany, and Belgium.

3.6. RQ6: What type of institutions developed these projects?

Approximately a total of 238 institutions participated in these projects, n=30, such institutions were sometimes involved in more than 1 project. Results have shown that Academia (Universities and Schools) executed most of the projects by 50%. In contrast, other projects reunited more participants from different backgrounds; depending on the objective, there were governmental ministries involved, RPOs (13%), Research Funding Organizations or RFOs (7%), companies, and multiple stakeholders (30%) gathered to encourage and facilitate all steps for women to join the STEAM sector.

3.7. RQ7: What are the target groups?

All the projects selected are developed in different contexts; therefore, different actors in 9 projects. The target groups are young girls and women referring to such projects that are developed in Universities and Schools. Although other specific projects developed evaluations, audits, assessments, and other types of interventions centred on how the GEP has been developed in different projects in RPOs, Universities, and RFOs (5 projects).

Nevertheless, specific initiatives that develop boot camps, or online courses, to train in a particular skill are more open to the public, looking to encourage not only women to join STEAM studies and careers. Despite the diversity movements, only one project included disabilities- MILIEU (Milieu, 2021), a project done in Bulgaria under the HORIZON programme.

It stands out that some specific projects seek to tackle the leaky pipeline phenomenon, such as EQUALS4EUROPE, a multistakeholder project valued at almost 3M euros.

4. DISCUSSION AND CONCLUSIONS

This study analyses the trends, proposals, and outcomes of EU projects funded by the European Commission that focus on encouraging the participation of women and young girls in STEAM, considering a period from 2019 until now.

The EC recognises that Europe needs to advance bigger steps towards gender equality in STEAM; therefore, the use of a gender mainstream approach as a “revolutionary concept that promises to bring a gender dimension into all EU policies” (Pollack & Hafner-Burton, 2000, p. 434). Policies, programmes, projects, and financial structure have allowed an investment of 57.985.618,69 € to tackle the gender segregation that narrows female participation in STEAM.

Efforts respond to what the call for funding is for, the trends are centered on bringing through these projects a future to hope for working around the following areas female representation; role models; developing skills; networking; attracting and retaining talent; developing self-confidence and self-efficacy; non-formal education and vocational work; job search and career advice; social innovation and entrepreneurship in STEAM sector. These lines of work are necessary for women and

young girls to access opportunities in the labor market in the short or long term. However, such projects lack specific information about their continuity or economic sustainability, which somehow threatens the initial investments.

Gender segregation and stereotypes contribute to limited life choices for women and employment options, perpetuating unequal power relations at all levels, public and private (European Commission, 2023, p. 29). For this reason, the solutions proposed by these projects are fundamentally interventions, sometimes mixed (diagnosis and intervention) approaches. The main activities in relation to the previous lines of work are the creation of courses or educational material through different platforms; skills bootcamps; encouraging and funding research in different lines, scientific conferences; frameworks, audits, assessment models, and policy recommendations that provide further information about the challenges found; networks (physical and online) for job search or career path oriented, as networks for entrepreneurial ventures.

Given the type of interventions, the principal outcomes developed are best practices, building capacity and strengthening lines of work; promoting knowledge transfer and international cooperation between regions within the EU and countries such as Turkey, Tunisia, Israel, Egypt, and more. In general, there are intentions and specific actions from many countries in the EU to contribute to promoting women in STEAM; nevertheless, most of the project's n=30 was led by South and Western European countries. The type of institutions considering the lines of work are universities, organisations, RPOs, RFOs, and schools, which convey with the project target women and young girls in most cases, but also organisations to create gender awareness about the challenges women face in their STEAM career path.

These projects are a valuable source of ideas, background study, and implementation practices that can apply to many contexts, and public or private stakeholders may consider that. Some of the projects that stand out for the variety of available outcomes are TInnGo (Transport Innovation Gender Observatory) <https://transportgenderobservatory.eu/the-observatory/>; EQUAL4EUROPE (Gender Equality Plans for Social Sciences, Business, and Management Schools) <https://equal4europe.eu/>; FeSTEM (Female Empowering in Science, Technology, Engineering, and Mathematics in Higher Education) <https://festemproject.eu/>.

In conclusion, there is still much to be done in Europe to achieve gender equality in the STEAM sector. Nevertheless, the investments, initiatives, and alliances analysed in this SRPR are very useful for getting close to social changes in specific sectors. Some limitations to pursuing this goal are the continuity of these projects, the intersectional view in them, the utilitarian idea of achieving this as a means to become an economic referent, and not because it is the duty of governments to give access to basic freedoms and fair, equal opportunities to everyone.

A final recommendation is to perform other SRPRs analysing how the factor of intersectionality in European projects articulates to give access to diverse women to opportunities in STEAM.

5. REFERENCES

- Anagnostou, D. 2022. EU Policy and Gender Mainstreaming in Research and Higher Education: How Well Does It Travel from North to South? Chapter 4 in “Overcoming the Challenge of Structural Change in Research Organizations: A Reflexive Approach to Gender Equality”, *Emerald Publishing*, pp. 73-89. Doi: 10.1108/978-1-80262-119-820221005
- Bishu, S & Alkadry, M. 2016. A Systematic Review of the Gender Pay Gap and Factors that Predict it. *Administration & Society Journal*, Volume 49, Issue 1. Doi: 10.1177/009539971663692
- Blickenstaff, J. 2005. Women, and science careers: leaky pipeline or gender filter? *Gender and Education*, 17(4), pp. 369–386. Doi: 10.1080/09540250500145072
- Cheryan, S.; Ziegler, S.A.; Montoya, A.K.; Jiang, L. 2017. Why are some STEM fields more gender-balanced than others? *Psychol. Bulletin*, 143 (1), pp. 1–35. Doi: 10.1037/bul0000052
- European Commission. 2023. Report on Gender Equality in the EU. Luxembourg, European Union. Available in: <https://bit.ly/3KpCM3k>
- European Commission, EC. 2022. Proposal for a Decision of the European Parliament and of the Council on a European Year of Skills 2023. Available in: <https://bit.ly/43USdY8>
- European Institute for Gender Equality-EIGE. 2017. Economic benefits of gender equality in the EU. Doi: 10.2839/970626
- European Institute for Gender Equality-EIGE. 2022. The Evolution of the EU’s policy and legal approach to gender equality. Available in: <https://bit.ly/44SBuGo>
- García, M. 2022. Critical analysis of the role of the European Union on gender equality progress. The case of research policy. *European Studies Review*, volume 79. pp. 457-472. Doi: 10.24197/ree.79.2022.457-472
- García-Holgado, A.; Verdugo-Castro, S.; Sánchez-Gómez, M.C. & García-Peñalvo, F. 2019. Trends in studies developed in Europe focused on gender gap in STEM. *In Proceedings of XX International Conference on Human-Computer Interaction*. ACM, New York, NY, USA, pp. 1-8. Doi: 10.1145/3335595.3335607
- García-Holgado, A; Verdugo-Castro, S; González, C; Sánchez-Gómez, M.C, & García-Peñalvo, F. J. 2020A. European Proposals to Work in the Gender Gap in STEM: A Systematic Analysis, in *IEEE Revista Iberoamericana de Tecnologías del Aprendizaje*, vol. 15, no. 3, pp. 215-224. Doi: 10.1109/RITA.2020.3008138
- García-Holgado, A; Marcos-Pablos, S; García-Peñalvo, J. 2020B. Guidelines for performing Systematic Research Projects Reviews. *International Journal of Interactive Multimedia and Artificial Intelligence*, Vol.6, No. 6. Doi: 10.9781/ijimai.2020.05.005
- Guo, J.; Eccles, J.S.; Sortheix, F.M.; Salmela-Aro, K. 2018. Gendered pathways toward STEM careers: the incremental roles of work value profiles above academic task values. *Frontiers Psychol.* p. 9. Doi: 10.3389/fpsyg.2018.01111
- Jiménez-Iglesias, M.; Muller, J.; Ruiz-Mallén, I.; Kim, E.; Cripps, E.; Heras, M.; Filipecki-Martins, S.; Van-Laar, M.; Tramonti, M.; Valenzuela-Zapata, A.; Gras-Velázquez, Á; Akue-Da Silva, A.; Alexopoulos, A.; Baldrusson, R.; Bes, M.; Benameur, Z.; Bogner, F.; Cala, V.; Ceuleers, E.; Daras, D.; Dochshanow, A.; Giampaoli, D; Kirmaci, H; Kolenberg, K.; Martev, I; Rosijn, S.; Siotou, E.; Tortosa, M.; Vizzini, C. 2018. Gender and Innovation in STEAM Education. Scientifix 4m. Available in: <https://bit.ly/3QsBZ5x>
- Keele, S. 2007. Guidelines for performing Systematic Literature Reviews in Software Engineering. Version 2.3, EBSE-2007- 01. Available in: <https://bit.ly/3QwNAjU>
- Kitchenham, B. 2004. *Procedures for performing systematic reviews*. Keele, UK, Keele University, 33(2004), 1-26. ISSN:1353-7776

- Kitchenham, B., Brereton, O. P., Budgen, D., Turner, M., Bailey, J., & Linkman, S. 2009. Systematic literature reviews in software engineering. *Information and software technology*, 51(1), 7-15. Doi: 10.1016/j.infsof.2008.09.009
- Manchenko, M.; Mazaj, M.; Puente Hevia, D.M.; Economides, A.E.; Perifanou, M.; Parmaxi, A.; Christou, E.; Papallas, A.; Loucaidou, E.; Chatzikiyriakou, A.; Katic, S.; Vidmar S. C. 2022. Gender-Sensitive Methodology: Trainer Guide. Available in: <https://bit.ly/3DGI08h>
- Milieu. 2021. Deliverable 3.1. Visibility and empowerment guidelines. Women, Disability, and Inclusion Scientific Excellence in Bulgaria GA No. 952396. Ref. Ares 6035116. Available in: <https://bit.ly/3DEwzNI>
- Navarro Sanz, B, & Sanz Gómez, M. 2021. La transversalidad de género y su poder de influencia: ¿Hacia una igualdad efectiva en la EU? *Revista CIDOB d'Afers Internacionals*, no. 127: pp. 39-62. Doi: 10.24241/rcai.2021.127.1.39
- Peña, M.; Olmedo-Torre, N.; Mas de les Valls, E.; Lusa, A. 2021. Introducing and Evaluating the Effective Inclusion of Gender Dimension in STEM Higher Education. *Sustainability*, 13, 4994. Doi: 10.3390/su13094994
- Petersen, K.; Feldt, R.; Mujtaba, S. and Mattson, M. 2008. Systematic mapping studies in software engineering, presented at the proceedings of the 12th international conference on Evaluation and Assessment in Software Engineering, Italy. Available in: <https://bit.ly/3qkVB0I>
- Petersen, K.; Vakkalanka, S. and Kuzniarz, L. 2015. Guidelines for conducting systematic mapping studies in software engineering: An update. *Information and Software Technology*, vol. 64, pp. 1-18. Doi: 10.1016/j.infsof.2015.03.007
- Petticrew, M. & Roberts, H. 2005. *Systematic Reviews in the Social Sciences: A Practical Guide*. Blackwell Publishing, Malden, USA. Doi: 10.1002/9780470754887
- Petrovic, T. 2021. Improving Female Researchers' Career through Gender Equality Plans actions: Experiences from a Slovenian Research Institution. *Public Policy and Administration*, Vol.20, Nr. 1, pp. 45-57. Doi: 10.5755/j01.ppa.20.1.28310
- Poggesi, S.; Mari, M.; De Vita, L.; Foss, L. 2020. Women entrepreneurship in STEM fields: literature review and future research avenues. *International Entrepreneurship and Management Journal*, Springer, Vol. 16 (1), pp. 17–41. Doi: 10.1007/s11365-019-00599-0
- Pollack, M. & Hafner -Burton, E. 2000. Mainstreaming gender in the European Union. *Journal of European Public Policy*, 7:3. Special Issue: pp. 432-456. Doi: 10.1080/13501760050086116
- Rawls, J. 1999. *Social Unity, and Primary Goods*. In *Collected Papers*; Freeman, S., Ed.; Harvard University Press: Cambridge, MA, USA, pp. 359–387. Doi: ISBN 9780674137394
- Rossiter, M. W. 1993. The Matthew Matilda Effect in Science. *Social Studies of Science*, Vol. 23 (2), pp. 325-341. Doi: 10.1177/030631293023002004
- Silander, C; Haake, U; Lindberg, L & Riis, U. 2022. Nordic research on gender equality in academic careers: a literature review. *European Journal of Higher Education*, 12:1, pp. 72-97. Doi: 10.1080/21568235.2021.1895858
- Stephen, C.; Ginther, D.K.; Kahn, S.; Williams, W.M. 2014. Women in academic science: a changing landscape. *Psychol. Sci. Public Interest: J. American Psychol. Soci.* 15 (3), pp. 75–141. Doi: 10.1177/152910061454123
- Tomassini, C. 2021. Brechas de género en la ciencia: revisión sistemática de las principales explicaciones y agenda de investigación. *Education in the Knowledge Society*, (EKS), 22. Doi: 10.14201/eks.25437
- Valdés, G.; Thomason, B.; Betancor, A; Jeria, I. & Troncoso, C. 2022. Technology, Gender, and Organizations: A Systematic Mapping Study, in *IEEE Access*, vol. 10, pp. 57461-57484. Doi: 10.1109/ACCESS.2022.3178088

- Verdugo-Castro, S.; García-Holgado, A.; Sánchez-Gómez, MC. 2022. The gender gap in higher STEM studies: A systematic literature review, *Heliyon*, Vol. 8, Issue 8. Doi: 10.1016/j.heliyon.2022.e10300
- Vleuten, A.V.D. 2007. *The Price of Gender Equality: Member States and Governance in the European Union (1st ed.)*. Routledge. Doi: 10.4324/9781315554006
- Vida, B. 2021. Policy framing and resistance: Gender mainstreaming in Horizon 2020. *European Journal of Women's Studies*, 28 (1), pp. 26-41. Doi: 10.1177/1350506820935495
- Wiken-Wilson, A. & Patón-Romero, JD. 2022. Gender equality in tech entrepreneurship: a systematic mapping study. In Proceedings of the Third Workshop on Gender Equality, Diversity, and Inclusion in Software Engineering (GE@ICSE '22). Association for Computing Machinery, New York, NY, USA, pp. 51–58. Doi: 10.1145/3524501.3527608
- Women Economic Forum -WEF. 2022. Global Gender Gap Report. Available in: <https://bit.ly/3qeJ7Yw>
- Woodcock, A.; Christensen, H.R.; Levin, L. 2020. TInnGo: Challenging Gender Inequality in Smart Mobility. *Journal of Road and Traffic Engineering*, 66 (2), pp.1-5. Doi: 10.31075/PIS.66.02.01

Publication 3

8.3. “Female Leadership Portraits in Commercial Movies: Gender Social Representations from the STEAM Sector”



FEMALE LEADERSHIP PORTRAITS IN COMMERCIAL MOVIES: GENDER SOCIAL REPRESENTATIONS FROM THE STEAM SECTOR

TATIANA BUELVAS-BALDIRIS, RAINER RUBIRA-GARCÍA
King Juan Carlos University, Spain

KEYWORDS

*Female Leadership
Gender
Women
STEAM
Social Representations
Commercial Movie*

ABSTRACT

To encourage girls and women to pursue STEAM careers, it is crucial to increase the positive representation of female role models in science. The study uses the Bechdel test and an adapted Greimas Actantial Method to analyse mainstream films. Results show that female characters are often attractive, Caucasian scientists, not mothers, and play secondary roles above all. The most represented careers were in Biology, Astronomy, and Social or Human Behavioural Sciences. Representation of women in leadership positions in the STEAM sector in commercial movies is clearly deficient.

PALABRAS CLAVE

*Liderazgo femenino
Género
Mujeres
STEAM
Representaciones sociales
Películas comerciales*

RESUMEN

Para animar a niñas y mujeres a seguir carreras STEAM, es crucial aumentar la representación positiva de modelos femeninos en la ciencia. El estudio utiliza el test de Bechdel y el Método Actancial de Greimas adaptado para analizar películas comerciales de gran audiencia. Los resultados muestran que los personajes femeninos suelen ser atractivas científicas caucásicas, no madres, desempeñando papeles secundarios, sobre todo. Las carreras más representadas son Biología, Astronomía y Ciencias Sociales o del Comportamiento Humano. La representación de mujeres en puestos de liderazgo en el sector STEAM en las películas comerciales es claramente deficiente.

Recibido: 17/ 10 / 2022

Aceptado: 23/ 12 / 2022

1. Introduction

The cinema, since its beginnings, connected traditional literature and theatre pieces, massifying and extending the function of these forms of communication for pure entertainment. "It is because of the cinema that the spectacle starts to have a major range of influence among audiences" (Guarinos, 2008, p. 103). For enjoyment is that people go to the cinema to watch a commercial film, and for the same reason is impossible to ignore the repercussions of female representation. In previous work done by Laura Mulvey (2006), she analyzed female representations in the cinema with a psychoanalysis approach, creating a bridge between concepts of how the cinema reflects and sometimes intervenes in the interpretation of social reality, and how this reinforces the patriarchal belief system that gives birth to certain social stereotypes for women, reproducing them through the big screen (Mulvey, 2006).

It is not accurate to assume that the lack of popularity of STEAM (Science, Technology, Engineering, Arts, and Mathematics) among women is solely due to its representation through role models in the cinema. Nevertheless, it does have an impact on the way young girls and adolescents see themselves reflected and drawn to reinforce stereotypes, behavior, and even physical appearance based on what they see in the films they are exposed to. In previous studies missing role models is one of the relevant aspects to battle in terms of gender inequalities (Kuschel et al., 2017). Although, these inequalities are present at various levels such as the microlevel (related to career progressions and glass ceiling), meso level (related to gender practices concerning the field of work/study), and macro level (related to networks of business and work, and relation of the field with the commercial world that confronts gendered language and attitudes) (Karataş-Özkan & Chell, 2015; Kuschel et al., 2017; Byrne, Fattoum & Díaz-García, 2019). Consequently, female representation in cinema playing key roles in STEAM is part of the social deconstruction that needs to be tackled.

The intersection between cinema and gender has been widely recognized and studied, some examples are "A theoretical perspective on Women's Cinema Representation" (Binimelis, 2016), "Phallic Female Models of Media post-modernism, an approach to analysis Avatar, Millennium and The Hunger Games" (Bernárdez, 2012), "Cultural Representations of Gender and STEM in popular firms from 2002-2014" (Steinke & Paniagua, 2017), among others. The social representation of gender is as consequence used to reproduce old schemes, and this is one of the reasons that makes invisible the key role of the scientific women in film characters, especially when talking about contemporary cinema. Therefore, it is necessary to delve deeper into how this low exposure of women leaders in the area of STEAM sciences represents a key factor that impacts the perception and influences the audience not only among young girls but in women about these areas of work and study.

The main objective of this research is to perform a qualitative and quantitative analysis, using the Bechdel test and an adapted Greimas Actantial Method, on the relevance and characteristics of the participation of female characters with leadership within the STEAM sciences, in commercial cinema from the period of 2000 to 2022, lastly seeking to motivate through public perception more young girls and women to participate and reflect in positive role models, to get involved in the STEAM sector as a future career path.

There has been limited research on the portrayal of specific stereotypes in regard to women in the professional realm of STEAM sciences. In most films, female scientists are depicted as single, strong, and intelligent, but not necessarily feminine, and sometimes depicted as being so consumed by the work that they neglect personal relationships. These characters often appear in the action, sci-fi, or dystopian films. The fantasy of an "unreal" world allows the authors to provide and play with the stereotypes as they pleased, challenging the heteronormative roles and only a few times breaking them.

This social representation is a system that nurtures culture, gives meaning to the existence of individuals, and, from there, to the structures of social distinction from which the different forms of power are erected. According to this theory, the social psychology of Moscovici (1961) arises. His proposal is a more social conception of attitudes, considering them as mental processes that determine the responses of individuals to a phenomenon of social characteristics such as values (Moscovici, 1961). Therefore, it is possible to claim that cinema and massive media are capable of influencing conduct, value, and even mental processes in individuals.

The Future of Jobs Report explains how is expected that by 2025, "approximately 85 million jobs may be displaced by a shift in the division of labor between humans and machines, giving as a result 97 million new roles that will be created, those are more adaptable between humans, algorithms, and machines across the 15 industries and 26 economies covered in the report" (World Economic Forum, 2020, p. 5). For this reason, was thought to be a slow-paced change for the labor market has increased in speed, and contrast, our future generations are not ready and will be the most affected by it. "Socially constructed gender differences and consequent inequalities persist today, resulting in the STEAM gender gap" (Wang & Degol, 2017, p. 119). Therefore, it is urgent to use all possible efforts not only to guarantee but to encourage young girls and women to join STEAM careers and to pursue jobs or be an entrepreneur in this field.

2. Theoretical Framework

By researching more about the origin of the underrepresentation of women in STEM areas, it is possible to observe that this is a problem of stereotypes due to the lack of female role models and a belief system that socializes gender in a marginalized way.

Hence, raising awareness of young girls and women and propelling their participation in STEM areas as well as, entrepreneurship is a political cause (European Education and Culture Executive Agency et al., 2018). Recent studies show that in higher education, there are no visible gender differences among students in these sciences (Marra et al., 2012). Nevertheless, there are significant gender differences in self-confidence (Eris et al., 2010), and previous research evidence shows that adolescents aged 12 and above watch a substantial number of movies annually, in various formats, with a preference for comedy, action and adventure, sci-fi, and fantasy films. Therefore, it is pertinent to review the causes that underlie in the role models they see in the cinema, and that might have somehow influence on them, as in adult reproduction of certain stereotyped behaviors.

In accordance with the theory of representations, which aims for a radical transformation of society through the modification of perceptions and stereotypes, “images, beliefs, and perceptions that are possible to change through social representations, which are already part of the culture” play a significant role in empowering women (Camberos, 2011, p. 45). Gender as a social construct defines expectations, roles, and social norms, and social representations of gender are often the result of new and/or old societal norms and relationships.

On the other hand, Judith Butler explained that “the sexual orientation, sexual identity, and gender expressions are the result of a social, historical, and cultural/production, and therefore there are no sexual roles or gender roles, essentially or biologically inscribed in human nature” (Butler, 1993, as cited in Duque, 2010, p. 87). Everything natural constitutes the naturalization of cultural constructions meaning that subjects are the effect and consequences of the production of knowledge and power devices that legitimize the essentialist conceptions of their gender and sexual differences, with which gender and sex become performative acts.

In other words, performative acts are forms of speech that authorize “they are expressions that enunciated and pronounced generate a binding action and power. As a result, performativity is a sphere in which power comes to life through the discourse aligned with acts” (Butler, 1993, p. 316). A relevant aspect of this concept is temporality. Performativity precedes history, meaning it is condition to contemporaneity, in such a way that this aspect detracts from the centrality of the present view of the subject according to which it is the origin or the exclusive owner of what is said (Butler, 1993, p. 319). Then, performativity creates reality through discourse that contrasts with the heterocentric hegemonic power that acts as a reproducer of its discourse in sociocultural contexts.

The hegemonic matrix with a hetero-centric perspective is exemplified by the societal expectation that men should not cry, dress in blue, have interests in power and masculinity, and avoid appearing “effeminate”. These norms are established and perpetuated through speech acts, gestures, and other cultural practices, becoming a requirement of the social environment and dictating predetermined behaviors related to sexual identity. As per the social cognitive theory, media such as films can be a crucial tool for analyzing the relationship between behavior and stereotypes, particularly with regards to women in the STEAM field. This theory hypothesizes that children absorb behavior patterns through continuous observation of models, in the same way, children can learn specific conducts through identificatory learning by watching films (Bandura, 1986, as cited in Steinke & Paniagua, 2017). The same can happen to viewers that will reflect on their own experiences and perceptions of what they see on the big screen (Faber, Brown & McLeod, 1979).

The relevance of social cognitive, representation, and feminist theories lies in the fact that as human beings, our social and psychological aspects are greatly influenced by the information we are exposed to, shaping our decision-making, raising questions within us, and constantly reshaping our reality, both consciously and unconsciously, as Mulvey emphasized throughout her work. For this reason, it is important to examine the concept of possible selves theory, which explains how individuals are and who they could become based on their past, present, and future experiences. These ideas reflect an individual’s personality and influence their behavior and decisions (Markus & Nurius, 1986). For instance, a person in a difficult situation may picture possible alternative mental scenarios and have a decision-making process led by their imaginary self of what to do. The impact of this concept is broad from leading conduct to life goals and career ambitions, as a result of this in the arts and cinema arena “films function as more than a simple mirror, it also works as a social memory and cultural metaphor” (Flicker, 2003, p. 308).

About the social representations of gender, “these are based on genetic social psychology and have undergone modifications thanks to a socio-genetic process, which consists of processes of generation of representations in which gender can be renewed” (Camberos, 2011, p. 47). Thus, social representations provide insight into how individuals perceive and organize their daily lives. This highlights the importance of communicative processes in creating collective knowledge, transforming historical events that are socially defined by time and space. It is relevant for this research to note that in

In political philosophy, there is a distinction between sexual orientation, rather than sexual identity, and gender expression, rather than gender identity, thus seeking to unify the public, collective but de-essentializing and de-

identifying it. This entails the deconstruction of the imperatives of binary logic of domination, such as good/bad, beautiful/ugly, normal/abnormal, black/white, straight/homo, and gay/lesbian (Duque, 2010, p. 92).

Therefore, the ultimate goal is to resolve contradictions and challenge rigid identities, fostering the rise of multiple, non-binary, and flexible differences.

2.1. Mediations and Greimas Actantial Method: the power of media

Martín-Barbero, the primary proponent of the idea of mediation, states that “audiovisual and computer technologies are rapidly advancing in the era of globalization and aim to play a crucial role in shaping cultural policies that counteract the homogenizing effects of neoliberalism, which, in turn, transform cultural industries into the economic and political foundations of regions” (Martín-Barbero, 2002, p. 14).

For Martín-Barbero, media is a market mediator, one that perverts the political and cultural demands and that delegitimizes any questioning of social order. Media holds impressive power, and its impact is highly risky or constructive depending on its use. For this purpose, communication becomes a powerful engine of detachment and inclusion of cultures, ethnic, national, local, time, space, market, and global technologies. Martín-Barbero explains that “from the side of culture, it escapes compartmentalization, permeating all social structures. Today, the subject/object of culture is the same as art, health, work, or violence, as political culture, or the culture of drug trafficking, among others. Culture in this system acts as a machine producing symbolic goods for this “public of consumers” (Martín-Barbero, 2002, p. 14).

According to Martín-Barbero (2002), media allows politics to shape and redefine new models of interpellation and representation in society. This type of mediation is not only productive but also intensifies the ritualistic and theatrical aspects of politics (Martín-Barbero, 2002). Martín-Barbero describes media as not only a tool but also a crucial part of public life, shaping political culture through forms of interaction, language, and culture. The social production of politics is intertwined with symbols and participatory elements that create the public sphere and mass communication. However, as the author describes the market as one transactional in all its relationships, in which “subjects lack meaning in the communication process, precisely because of the market’s nature that can only provide small satisfactions or frustrations, based on profitability, not one that creates social innovations” (Martín-Barbero, 2002, pp. 16-17), a condition convenient for the film industry.

The exposure to media, audiovisuals, and social networks, among others, have become vitally important to convert a two-way exchange of values, customs, habits, thoughts, and criticisms, a process as Martín-Barbero says, “with endless interactions product of social dynamics subsequently materialized through television, radio, theater, among others; making it clear that the important reproductions are those of the market, those that far from providing value and meaning to the human being, make profitable and commodify everything around them” (Martín-Barbero, 2002, p. 17).

In addition to the mediations, it is important to mention its connection with the Actantial Method of Greimas, often used to analyze texts or images in the hope of finding the structure of the text, in other words, to explore the narrative in its paradigmatic level. So far, we have developed ideas around representations, mediations, and gender, alongside narratives and discourses we can attach the symbolic effect of power often implicit in all forms of communication and social interaction, and that is pertinent for this research.

Greimas’ theory was an advanced development of Levi-Strauss and Vladimir Propp’s theories “to understand the roles across narratives, the action schemes to what roles are embedded and the cognitive operations that underwrite both, roles and actions” (Carney, Robertson & Dávid-Barret, 2019, p. 4). The Greimas Actant method is based on a subject / Hero that does an action to solve a problem, often followed by activities divided into acts (Greimas, 1983, p. 59-60). Throughout the implementation of the Greimas method, it plays a crucial role in the subject, the object (the problem to solve), the sender (the element that sends the object), the receiver or destination (not necessarily a place), the helper or opponent as elements that assist or blocks the subject, as well as, the relation of conjunction or disjunction (positive/negative relationship between subject and object), and the power axis which can be conflictive, or cooperative (Greimas, 1983, p. 75-77). This way the pragmatic level of the narrative is plausible and it creates another level of understanding as a result of narrative trajectory, role identification, agency, and mediations of the women in STEAM portraits in the commercial cinema.

2.2. Context

Gender studies applied to audiovisual communication and audiences nowadays count with a large number of research projects. During the 60s started the feminist movement to create a bridge between these theories applied to the communication and audiovisual sciences. Nevertheless, it was not until 70’s that the research and movement took off with authors like Sharon Smith who studied the participation of women in the cinema, among others, involved in a sociologic and empirical analysis of films (Binimelis, 2016, p. 11). As a result, during the ‘70s alongside with the second feminist wave, in Europe emerged several thinkers that critiqued historical materialism, structuralism, semiotics, and psychoanalysis that give birth to other interpretations of the political constitution of the subject, such as Laura Mulvey mentioned before.

In the semiotic approximation of the feminist cinema, the discussion is about women being the center of the representations that promote mainstream cinema, and what is the role of women in the processes through which it constructs meaning, in simple words, the cinema functions as a signifying system within which the woman acts as a sign, the relevance in the interpretation made by the semiotics is based in the meanings that arise from the relationships that happen between a system of signs (other individuals), those signs interact through norms, codes, and conventions that provide structure to the discourse (Binimelis, 2016). Thus, another still today famous analysis was the book *Visual Pleasure and Narrative Cinema* written by Mulvey (2006) where she described the reduction of the female figure to an object on which male fantasies are projected through certain codes and conventions, leading both the male spectator and the female spectator to develop processes of identification with the male protagonist.

The feminist movement kept growing and so did the number of authors studying the relationship between cinema, culture and, different categories such as Gender, Class, Age, Race, all within the complexities of hierarchical power relations. Most of these feminist authors based their theories or analysis on

Michael Foucault's theories of "technologies" of power (from "technos", "power", and "logos", "knowledge"), to his interpretation individuals are about forces in tension, coming from all directions, whereby each individual is both a product and producer of power, as he or she continually negotiates his or her position in the existing order of forces (Binimelis, 2016, p. 16).

In contrast, Mary Ann Doane focused on the agency capacity of spectators and the multiplicity of possible interpretations. Doane explained that the identification processes put the spectators in terms of proximity and distance concerning the feminine image, as a consequence different and complex forms can be perceived and interpreted without necessarily feeling identified with the dominant models (Doane, 1991, as cited in Binimelis, 2016, p. 17).

The scenario has evolved over the course of the feminist movement and the emergence of authors who have studied, published, and raised awareness about these issues since the 1960s. Initially focused on women behind the camera, the focus has shifted to the analysis of women in front of the camera and as part of narratives and power dynamics, offering various perspectives to comprehend the impact and representation of women in mainstream or commercial cinema.

Considering these theories, we believe is pertinent to briefly mention what is the audiovisual structure of the audiences in Europe to be able to land the topics to the eyes and minds of real humans. The European Commission did an online survey of 4.608 Europeans aged 4-50 in 10 countries (Croatia, Denmark, France, Germany, Italy, Lithuania, Poland, Romania, Spain, and the United Kingdom). The survey took place from March to April 2013 (The European Commission *et al.*, 2014). In this report, the main features were that "97% of respondents watch films at least sometimes, whereas 54% say they do so every day, compared to 56% that watch TV series. Across the 10 European markets, virtually 100% of respondents own at least, one device that enables the consumption of video or films at home" (The European Commission *et al.*, 2014, p. 5). Nevertheless, in the same report (2014) is stated that 87% of the people attend the cinema; "children's interest in films is strong by 85%, and they go more to the cinema than young adults. The main motivations to go to the cinema are 96% to entertain oneself and have fun, 96% to spend time with family or friends, 90% to discover and learn about people and cultures, 91% to experience strong moments and emotions" (pp. 5-6).

Regarding the question of how to decide what to watch, individuals replied that the most important criteria were genre and story, and an interesting cast. Women decides in terms of genre and type of film and whether it is adapted from a book, whereas men care more about the director and production values, the settings, and the lead character. Following, "recent European films had been seen only by 10-15%, while US films had been seen by 30-50% of the population in each country, even though the fact that they also agreed on "European films are less stereotypical than US films" (The European Commission *et al.*, 2014, p. 10).

When audiences were asked about what they disliked in US productions, they mentioned "the violence", "too commercial", "predictable", "exaggeration", "propaganda", "patriotism", "stereotypes", and "superficiality". Among the genres, the most watched by different targeted audiences are comedy, action, and adventure. However, when they were asked about which type of films, they would continue to see in the cinemas they said comedy, action, sci-fi, horror, adventure, fantasy, thriller, and animation. On the contrary, the least cited were historical films or epic films, documentaries or biographies, romance, and drama (The European Commission *et al.*, 2014, p. 10). In addition to the valuable insights provided in the report, the experts at the end of the report emphasize numerous concerns for both the European film industries and film policy.

From Southern European countries such as Spain and Italy, to Northern European nations like Lithuania and Denmark, the most widely watched films are from the U.S. Although they also pay attention to festivals and independent films, a connection is formed across the continent. Similarly, the waves of feminism have had a cross-border impact from the U.S. to Europe from the 1960s until today, strengthening the movement. Despite cultural differences that may exist between Spain and Lithuania, and the rest of European countries, it's important to note that these differences do not prevent individuals from experiencing the same emotions, feelings, and interpretations of the representation of women in mainstream cinema.

3. Methods

To analyze the films, a combination of techniques was utilized. Firstly, the Alison Bechdel (1986) test, which consisted of three simple questions being applied to every film watched, was used to identify more about the narrative function of female characters. Secondly, an adaptation of the actantial method developed by Algirdas Greimas was also employed.

This research aims to understand the representations and characteristics of women in STEAM as portrayed in commercial cinema, with a focus on their leadership and entrepreneurial aspects. The study analyzed films produced between 2000 and 2022 and compared the results to similar research in the field. The roles, power relations, mediation, and narrative characteristics of these STEAM female characters were analyzed in the light of recent theories to gain insight into the potential impact of the stereotypes portrayed in these films on the widespread audience.

The Bechdel test was created to assess the representation of women in movies, this way researchers could spot manlike preconceptions (Scheiner-Fisher & Russell III, 2012, as cited in Agarwal et al., 2015, p. 830). Nevertheless, "is a very general method as it only asks three simple questions: 1) are there at least two named women in the movie? 2) do these women talk to each other? And 3) do these women talk to each other about something besides a man? In case the answer is "yes" to all these questions, the movie passed the test" (Agarwal et al., 2015, p. 830). This method was also applied to measure the presence of women in conversations held on social media platforms (García, Weber & Rama, 2014). After analyzing these questions, it is possible to say that women are or not seldom portrayed as strong leaders and thinkers in popular media.

After applying the Bechdel test, an adaptation of Algirdas Greimas actantial method was made. "Since the moment we have considered the film character as a narrative category resulting from the sum of traits (physical, psychological, moral, or sociological characteristics)" (Pérez-Rufi, 2016, p. 539), in which people can be reflected and that has a significant impact on the way women is represented in the mainstream (dominant) or commercial cinema, it is important to bring these theories to understanding, into consideration

The method created by Greimas describes as "[Favoring] the verbal (referring to actions) as opposed to the nominal (referring to objects) aspects of narrative" (Marsen, Biddle & Noble, 2003, p. 4). In simple words, the narrative in the cinema begins with a problem to solve, in which some performers act, and as a result, the initial problem is solved or not. Accordingly, the theory developed in a trajectory or phases in which the individual/hero executes the action to solve the issue. The trajectory is defined as:

1 step) qualifying test which corresponds to analyzing the competence. The individual has resources to help bring them to another stage, 2 step) A decisive test where the subject/hero uses the resources to deal with the action, based on the initial problem, 3 step) Glorifying test where the recognition is made of either the solution or the lack of closure to the problem (Saraswati, 2022, p. 315)

Having the process of Greimas in mind, some adaptations have been made in the matrix for analysis considering the volume of movies to analyze. The axis analyzing the sender has been erased, as the purpose of this research is not of our interest, instead, we care about if the woman performed any relevant activity demonstrating her leadership and resources to solve the issue. Additionally, in the steps we have also included the following question: what is the main reason for helping or opposing? as a means to understand the conjunctions, disjunctions, and power-like traits between the object and the subjects and their motifs, this is to provide insights if it is the case, that women had the power to execute and solve the initial problem, among other relevant decisions in the plot of these films.

3.1. Sample

Besides previous research done in this area such as the examination of how women are portrayed in films in the context of fourth-wave feminism, twelve characters were depicted from a sample of eight films (Kool, Azevedo & Avraamidou, 2022) using socio-logical film interpretation counting on categories such as occupation, socio-political theme, and timeframe. Nevertheless, the eight films were taken only from Movie Database (IMDB) considering keywords related to the topic, for us, it is vital to broaden the spectrum as IMDB is not the only and most used database when individuals look for a movie or a recommendation to watch, where for example Rotten Tomatoes, also plays a key role among others.

Therefore, we took part in the film database used in "Cultural Representations of Gender and STEM: Portrayals of Female STEM Characters in Popular films 2002-2014", research conducted with a similar objective but analyzed with their coding and signs method; despite this, we amplified the list of movies using the IMDB by (Steinke & Paniagua, 2017), Rotten Tomatoes and Google search released from 2014 to 2022. The keywords used for the search were: movie and scientists, women scientists movie, female scientists movie, women astronaut movie, women computer scientists movie, female researcher movie. From this search, we had to carefully select some movies, as simply searching by keywords was not sufficient to determine whether a female scientist was the lead or co-lead in a movie, unless it was a documentary that was based on someone's life. We also had to take into consideration the cast members of the movie to ensure that they were included in the list.

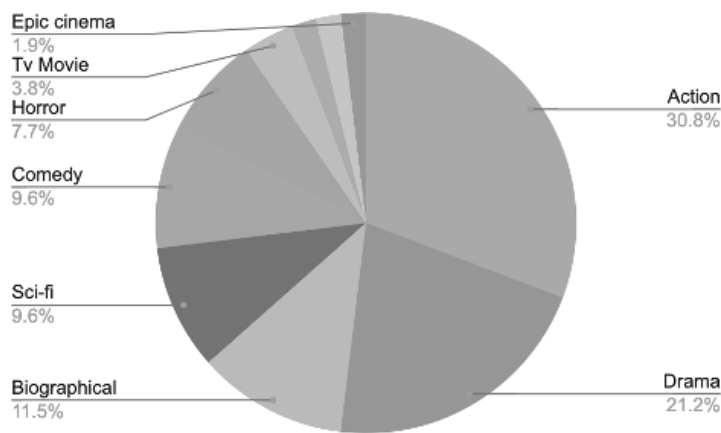
From this exercise, we have gathered a list of 60 films and series. However, we are not studying 5 of them because they were series, such as: *Diagnosis* (Lisa Sanders, 2019), *Emily's Wonder Lab* (Emily Calandrelli, 2020), *The dropout* (Elizabeth Meriwether, Michael Showalter, Francesca Gregorini & Erica Watson, 2022) and *Lost in Space* (Matt Sazama, Burk Sharpless, Irwin Allen, Tim Southam, Deborah Chow, Alice Troughton & Neil Marshall, 2018). In addition, three other movies that appeared in the search with past keywords but dated from 1994-1997 or earlier were not taken into consideration, leaving a total sample of 52 movies to be analyzed using the Bechdel test. As a result of the films that passed the Bechdel test, a representative sample of 4 out of 7 movies was selected for application of the adapted method of Greimas.

4. Discussion & Results

As discussed in context and theories, audiences have as much responsibility as filmmakers, not only because of the impact of those productions they support but from the psychological conscious or unconscious impact of such representations compared to real life, which is dependable on the audience's will. Therefore, it is not strange that industries support what is more commercial and produce more profit. Despite this, there have been some changes already in the film industry as now is more frequent to find throughout different film genres, more minorities, social issues, and inequalities depicted, in an attempt to either connect at a deeper level with the political, economic and in general, with the social issues or an attempt, to connect, with people's emotions as another marketing/financial strategy to promote movies.

The female representation in the films analyzed with the Bechdel test is to provide information on how relevant the female character for the development of the plot was and, therefore, to understand in depth the stereotypes reproduced in films and their massive impact on the audiences who watch them. During the Bechdel test, the 52 movies passed through the following filters: T1) Are there at least two named women in the movie? T2) Do these women talk to each other?, and T3) Do these women talk to each other about something besides a man? Findings show that 51% of the total movies passed the T1 or first question, 38.8% of the movies approved the T2, and 10% managed to get the 100% of a "female successful representation" in a movie, as it is possible to see in the following graphic.

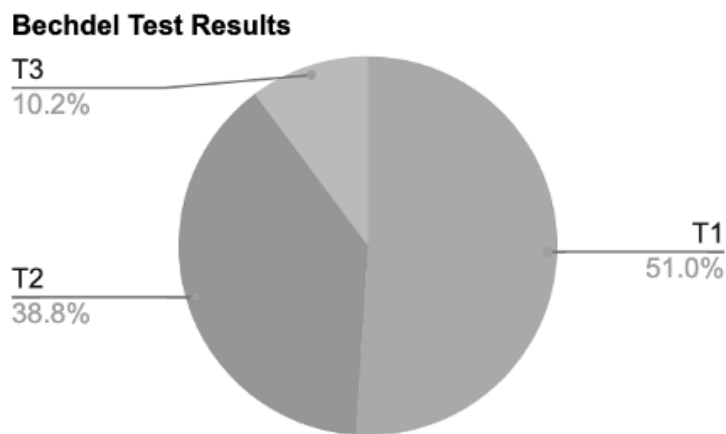
Figure 1. Bechdel Test Results.



Source: Authors' own elaboration, 2022.

Going beyond the Bechdel test, the results provided additional information such as the genre of the 52 movies 30% are action movies, 21% are drama, 11% are Biographical, and 9% are Sci-fi. In addition, only 11 % of these movies approved the three questions asked in the Bechdel test, compared to 88% of films that failed it.

Figure 2. Bechdel test vs. genre categories.



Source: Authors' own elaboration, 2022.

4.1. Bechdel Test results in contrast with the context

"Film is a psychological product of human beings. The research on film cannot be divided into the single scope of linguistics or any single discipline" (Luan et al., 2022, p. 71). As a result, to interpret the Bechdel Test is necessary to mention theories related to psychology, behavior, and more, to contrast the results and to understand the impact of the underrepresentation of the scientific women portrait in current films.

In previous studies conducted by the University of Rochester, the evidence shows that the test fails to reveal the hidden gender disparity configuration, essentially because a film can pass the Bechdel test and still portray women as auxiliary characters with few screens time (Yang, Xu & Luo, 2020). Additionally, one aspect that seems highly important in Film studies is the Box Office Return, which functions as a success measure of movies. In the same Rochester Study, the evidence suggests that previous reports from the tech company Shift7 state "from all the 350 films analyzed those that passed the Bechdel test, also surpassed the box office returns of films that fail this test" (Shift7, 2017).

In this research the center of all is placed in the relevance for the market of those films, confirming that directors and filmmakers respond to trends, industry preferences, budgets, and material, not essentialist matters as Martín-Barbero explains in mediation theory. This might be the explanation why there is a movie *Hulk* (Ang Lee, 2003) and a recent She-Hulk character by Marvel in secondary movies, or *Thor* (Kenneth Branagh, 2011) and a Female version of Thor, as a secondary superhero story, responding to a current pinkwash trend in the industry; instead of creating a complete and whole new version of what any women can be, but that might not necessarily be as commercial, as De Beauvoir (2015) explained when discussing about the androcentrism, the man is the point of reference by which women is measured.

In this research, 88% of the movies that did not pass the Bechdel test significantly featured a female scientist as the lead or co-lead. However, the interactions of these characters were not necessarily with other women or about something other than a man. In fact, in most of these movie plots, the active and agentic individual was a man who had some sort of relationship with the female lead or co-lead scientist.

For better illustration, consider the film *"Bombhell"* (Jay Roach, 2019), which details the sexual harassment case at Fox News and focuses on Gretchen Carlson, a famous TV host who sues Roger Allies, the former FOX owner. Although Gretchen interacts actively with both men and women in the film, all conversations revolve around the male central figure, as he is a crucial part of the story. Another example is the film *"Interstellar"* (Christopher Nolan, 2014), which passes the first two questions of the Bechdel test, but the interactions between women and other men are centered around the mission to rescue Cooper, who is stranded on another planet. In both of these films, female scientists are depicted as strong co-leaders, one as an astrophysicist and the other as a powerful TV host, but their stories and characters are inextricably tied to the men who hold positions of power over them. This pattern can also be seen in other films, such as *"Contagion"* (Steven Soderbergh, 2011), *"Down of the Planet of the Apes"* (Matt Reeves, 2014), *"The Day the Earth Stood Still"* (Scott Derrickson, 2008), and more.

On the contrary, *Arrival* (Denis Villeneuve, 2012) and *Ágora* (Alejandro Amenábar, 2009) are plots where scientific women played a key role as lead or co-lead, however, the female character was the only one in the whole movie, with no interaction with other women and therefore, we can directly discard the third question/answer from the Bechdel test. The same happens in films such as *Gravity* (Alfonso Cuarón, 2013) where Dr. Ryan

Stone is alone in space and is practically a monologue about how to come back save to earth. Nonetheless, these portraits of women are “legit to the gaze” of a man, as they have fought with all physical strength to achieve their goals without recurring to their “women weapon’s” (Bernárdez, 2012, p. 92). Throughout these movie portraits and the Bechdel results, there is sufficient evidence of imbalances not only in the power relationship between the characters of those movies, lack of representation of scientific women in these contexts, and few interactions that place women as a crucial agent connected to the plot center.

Nevertheless, “if we understand the mediatic representations as a kind of collective imaginary, where not reality but a “symbolic representation” of that reality is represented, that is, a scenario where we see “incarnated” in fictions not only the structures of power but also its ghosts: all possible forms of subversion” (Bernárdez, 2012, p. 93). It becomes clear that media is a contradictory and invisible power that can be both conservative and reproducing of stereotypes, norms, and at the same time it has the capability to alter everything. This raises the question of who is responsible for demanding films with different characteristics - the consumers or the market? The truth is that, based on the results of the genres with more interest being action, drama, biographical, sci-fi, and comedy, and comparing it with audience reports from European countries, it can be concluded that the market and budgets dictate what filmmakers should do.

On the other hand, “film has a mirror image system with metaphorical meaning, which is composed by moving pictures” (Luan et al., 2022, p. 72). Having considered this, it becomes evident that film holds a significant place in our lives, as despite cultural and individual differences, certain visual images, such as “rain or sky”, are universally recognizable. As stated by Luan et al. (2022, p. 72), “film has more universality and general principles than language.” This challenges the notion that cinema does not shape people’s belief systems, and places responsibility on the consumers, as the images we see are a reflection of our own perspectives and worldviews.

To elaborate further, it has been noted that “the space-time processing of films produces second-level significance to the audience. For example, when describing a person living alone in the forest, under a panoramic shot, the person is in a corner of a dense forest; while under a close shot, the half-body image of a person matches with the dense forest behind” (Luan et al., 2022, p. 72). This is why films are so powerful and captivating, as they not only present images and narratives, but also tap into the symbolic and sensory aspects of viewing, engaging the audience in a way that mere words cannot. The audience is therefore not just passive receivers, but active participants in the experience that films provide.

Additionally, of the 65 female characters in STEAM-related careers, 22% were biologists, 11% worked in computer science, 8% in engineering, 6% in psychology and astronomy, and the remaining in professions such as pilots, archeology, medical engineering, writing, research, and neuroscience. A majority, 76%, of the female characters were White/Caucasian, 9% Black or African American, 9% Asian or Indian American, with at least 3% Hispanic/Latino and 1% multiracial. With regards to age, 40 out of 65 female characters analyzed were between 20 and 30 years old when they appeared in these movies, while 21% were aged between 30 and 40 and only 9% were over 50 years old. This goes beyond the Bechdel test and sheds light on the intersections of ageism, race, and ethnicity, thereby highlighting the presence of stereotypical narratives and symbolic visualizations.

At last, “studies have shown that African American music videos were significantly more likely to portray sexual content and sexualized female characters more than White videos” (Turner, 2011, as cited in Yang, Xu & Luo, 2020, pp. 12-13), thus showing a relevant factor that can influence the image of a film character. Besides this, “women and men above 60 are underrepresented” (Lauzen & Dozier, 2005, p. 437), as well as “Older actresses experience greater difficulties in finding jobs (...), the majority of the male characters are in their 30s to 40s, whereas the majority of the female actresses are in their 20s and 30s” (Treme & Lee, 2013 as cited in Yang, Xu & Luo, 2020, p. 13). The reason for this disparity is that as men age, they tend to attain leadership positions and wield greater power in their occupations. However, women are less likely to attain such goals (Yang, Xu & Luo, 2020, p. 13). This raises another concern, namely the lack of positive representation of scientific women in commercial cinema, without any barriers imposed by age, ethnicity, race, or gender.

4.2. Greimas Adapted Method: Men is the verb, Women the vowel

The grouping of the information obtained from the implementation of the adapted Greimas Method by the genre of the selected movies are now addressed. First of all, the results and analysis of biographical films, followed but not compared to, sci-fi films.

A brief outline about the first movies to analyze: *Hidden Figures* (Theodore Melfi, 2016) and *Radioactive* (Marjane Satrapi, 2020), are biographical films. In these films, the subject/hero is a scientific woman, on one side we have African American Technical Engineers and Mathematicians, and on the other Madame Curie, a Caucasian Physicist and Chemist recognized worldwide. *Hidden Figures* describes a story of segregation by race and sex that takes place in 1961, and the plot is about how Afro-American women helped NASA to take an astronaut on a space ride and bring him back home safe, against all odds. Whereas in *Radioactive*, we see a tale of Marie Curie’s life story in Paris in 1934 when she was trying to create her laboratory and, be able to find the polonium and the radium, which provided her with two Nobel Prizes in her later years.

This summary is here to contribute to the basis of the Greimas Adapted Method. The information has been grouped into patterns and highlighted the differences.

In *"Hidden Figures"*, the central focus was on the remarkable contributions of these women, who played a crucial role in sending a U.S. astronaut on a successful space mission, beating the Russians to it. On the other hand, the biopic *"Radioactive"* depicts the challenges and confrontations faced by the iconic scientist "Madame Curie", including the lack of a laboratory and support from the University, in her quest to prove the existence of a new chemical element. The narrative in *"Hidden Figures"* revolves around the protagonists' journey as they strive to prove their competencies and secure higher positions at NASA. Through their hard work and determination, they eventually take charge of the operation of an IBM machine and make the crucial calculations that led to the successful space mission. The story of "Madame Curie" follows her journey from her arrival in Paris and meeting Pierre Curie, who later became her husband and key collaborator. Despite the University's denial of support, they persevered and conducted experiments together, solidifying their legacy as one of the greatest scientific partnerships of all time.

The qualifying test: Crucial moments are in both movies when these women had to prove their competency to solve the initial problem. The African American women were presented with mathematical problems and formulas that they needed to solve in order to ensure the safe journey of the astronaut into space and back to Earth. On the other hand, Madame Curie's journey involved conducting various experiments with her husband Pierre, initially facing challenges and inefficiencies, but eventually discovering radium. Decisive test: The outcome of the challenges faced by these women was triumphant. Glorifying test: In *Hidden Figures*, the women were able to complete all necessary calculations on time, successfully sending the astronaut into space and bringing him back safely. Meanwhile, Madame Curie and Pierre were able to confirm their theories and discoveries of polonium and radium. These achievements were not only significant for the women themselves but also for the advancement of their respective fields.

To interpret this method, it is necessary to evaluate the nature of their relationship, the conjunctions or disjunctions, the helpers, and the opponents to be able to complete the narrative analysis. In both scientific female portraits, we can see how White men executed power in their privileged positions and created oppression in the life of these female characters, these women were working in fields where men were back then the rule, and women had not to leverage at all. Therefore, the main opposition was based on the grounds of gender, nationality, ethnicity, and race.

All the characters that opposed each other in the past movies were men acting out of jealousy, ignorance, and discrimination. Distinctive traits of psychological abuse included damaging their reputation through tactics such as obstructing their work and exerting leverage. Unfortunately, this type of behavior remains prevalent today. Conversely, women's proactive responses to challenges were shaped by their interactions with supportive individuals such as peers, husbands, and colleagues. These allies helped break the cycle of oppression by providing encouragement, building confidence, and offering support for women to pursue their passions.

In the axis of power, men are the one who carries the final decisions to solve the initial problem, holding both, agency, and leadership. However, these films showcase the triumphs of women who were ultimately vindicated. Through the medium of cinema, the viewer is given the opportunity to relive these moments and gain a deeper understanding of the injustices and discrimination faced by these women. The representation of these biographies, through the use of powerful language, gestures, and cinematographic effects, effectively transports the audience to a place of empathy and anger towards the oppression experienced by them. The films also challenge the stereotype of the solitary, unmarried scientist by showcasing women who had supportive families and spouses who admired and encouraged their ambitions.

Additionally, a noteworthy fact is the portraits of eastern women who were both scientists and inventors. The same passion and intuition that drive Madame Curie are present in Eva Maria Kiesler or "Hedy Lamarr" portrait. She became famous for being cataloged as one of "the most beautiful women" in the cinema during the 1930s. In *Hedy Lamarr's biography* (Alexandra Dean, 2017), it is possible to see her talent in the cinema, also her curiosity to build and create. Hedy's hobby led her to change airplane wing design and create a system to stop German torpedoes during the Nazi war with a frequency communication technique. Her inventions were stepping stones that led to the creation of WIFI and Bluetooth.

Two women from Austria and Poland had bright careers far from home, both accused at some point by "opponents" for expressing their sexualities freely, and for doing so, the press and society back then tried to jam their careers publicly. Nevertheless, Hedy Lamarr's story is not worldwide known as Madame Curie's movie is not the most watched. These movies create social conscience, but none of them was more box office successful than *Top Gun Maverick* (Joseph Kosinski, 2022) or even *Jurassic Park* (Steven Spielberg, 1993), films that effectively achieve the goals of the market (Martín-Barbero, 2002, pp. 16-17). Even though biopics contain facts that are part of the life story and work of the real women portrayed in these films, biographical films are less popular than other film genres.

Next movies are two exciting science fiction films, *Avatar* (directed by James Cameron in 2009) and *Prometheus*

(directed by Ridley Scott in 2012), both created by filmmakers from the US and UK. First a quick overview of each movie, *Avatar* takes place in 2154 and explores the story of humans trying to secure a mineral known as unobtainium from Pandora, a world inhabited by the Na'vi, a tribe of human-like beings with a deep connection to nature. Meanwhile, *Prometheus* follows a spacecraft as it responds to a persistent call from humanity's creators, which is interpreted by two archaeologists through a star map found in ancient wall drawings across the Earth. The crew embarks on a journey to investigate this map and make contact with their supposed forerunners, whom they call "the engineers."

Building upon the Greimas adapted method, the central conflict in *Avatar* revolves around humans seeking to obtain minerals from Pandora. To achieve this goal, they send in a spy, Jake Sully, who becomes a trusted ally to the tribe and helps the humans to understand their way of thinking, communication, and protection of the mineral-rich area. On the other hand, in *Prometheus*, humans have seemingly uncovered information about their creators and embark on a space journey, funded by the CEO of the Weyland Corporation, to meet these beings referred to as "the engineers". The expedition is led by the CEO's daughter, Mss. Vickers, who serves as the captain.

In the narrative sequence, Jake Sully is enchanted by the beauty of Pandora and its tribe. Through his adventures, he locates the mineral deposits. However, his initial plan to betray the tribe is foiled when he falls in love and forms a bond with a Na'vi named Neytiri. In *Prometheus*, the story begins to unfold as soon as the crew arrives on a distant planet. The scientists disembark from the spacecraft to explore what appears to be an isolated location. Upon entering a cave, they find that the air is breathable and remove their protective masks. Unfortunately, one of the crew members becomes contaminated with an unknown alien DNA.

The qualifying test: The time has come to extract the minerals, and Jake Sully is informed by the company leader of a military operation aimed at securing the unobtainium peacefully. On the other hand, in *Prometheus*, the alien DNA merges with human DNA, transforming some of the crew members. After undergoing an abortion of an "alien child", the archaeologist Elizabeth Shaw is left reeling with emotions. She has lost her boyfriend and just undergone a traumatic experience. Determined to understand what this DNA is doing and find a way to stop it, she sets out with David (a synthetic life form) and the elderly CEO of Weyland Corporation, who has discovered in secret that this location is actually the site of a crashed alien ship.

The decisive test starts in *Avatar* when Colonel Miles from military security starts a war and decides to take down the "giant home tree". Jake decides not to cooperate with humans, and so does Dra. Grace and other colleagues who wore their avatars to join them on the battlefield, many Na'vi and humans die in this confrontation. Na'vis was losing until Jake Sully appears with a dragon-like creature and regains Na'vis trust. On the contrary, in *Prometheus* all seems lost, David is the only one who can manage to understand the spaceship and he wakes up one "Engineer" that is still alive and sleeping in the vessel. But the "Engineers" starts to kill them all, therefore everyone tries to save themselves.

In the glorifying test of *Avatar*, Jake Sully assumes leadership of the tribe to join the war, Dra. Grace, other humans, Pandora's wildlife, and Na'vi clans join to fight. As a result, humans lose the battle, Jake becomes a Na'vi and Dra. Grace tries the same but unfortunately, she dies. On the contrary, in *Prometheus'* glorifying test, Elizabeth Shaw manages to run away with David at the end of the movie, although the answers she and the CEO of Weyland were looking for never got to be. The rest of the crew dies at the hands of the aliens.

Dystopian films and biographical movies cannot be compared, as science fiction movies are grounded in imaginative, alternate worlds where the laws of reality may be distorted and don't necessarily have to make logical sense. On the other hand, science fiction is a genre rich in symbolic systems that depict human-like forms of social organization, communication, and interaction that are easily relatable. For instance, the concept of "Engineers" symbolizes a divine or God-like entity, much like the story behind the Na'vi in *Avatar*. The power dynamics among the Na'vi are similar to those of a human tribe, with the oldest member serving as the leader and embodiment of wisdom, the mother functioning as the shaman who heals and connects the tribe to nature, and the children inheriting the leadership role. As such, Neytiri in *Avatar* is expected to mate with the strongest member of the tribe.

This symbolic way of re-signifying the dystopian characters follows a pattern of what is close to the ways we humans in real life interact, our environment, the problems we have, and the feelings that all those problems arise from us, therefore making the stories closer to our eyes and easy to identify with. Another great example is when Dra. Grace in *Avatar*, who represents a brilliant Astrobiologist that has years of experience treating the Na'vis, displays since the beginning of the movie the importance of nature for the Na'vis, which is equivalent to the real-like problems with climate change and indigenous people who protect nature.

Both *Avatar* and *Prometheus* feature greedy and violent business tycoons who seek to exploit the resources of Pandora without regard for the lives of its inhabitants or the environment. This mirrors the struggles faced by ecofeminism. In *Avatar* for instance, while Dr. Grace plays a crucial role in understanding the Na'vi language and culture, as well as uncovering the secrets of Pandora, a battle takes place, and she passes away before she can fully become her avatar. Instead, it is Jake Sully who rises as the hero and saves the day, continuing to live among the Na'vi people.

The situation is not too different in *Prometheus*. The company's CEO's daughter Ms. Vickers is an irrelevant character. She is against the expedition as she considers it a waste of money and time. Her portrait is intriguing because she is a selfish businesswoman who does not care about exposing her economic interest and is the foremost opponent of the expedition. All those who are in favor of the expedition as helpers are the archeologists, the elder CEO of the company who believes he can have certain "answers" about life from the "Engineers", and David, the life form.

In their characterizations, it is notable that Vickers embodies a woman who wants control, authority, and the freedom to express her sexuality without concern for others. However, she is portrayed as a spoiled child who defies her father's commands and is constantly sabotaged by David's attempts to undermine her leadership on the ship. In the end, Vickers meets a gruesome fate as she tries to save herself from the madness of the mission to meet the "engineers". In comparison, Elizabeth Shawn is a successful archaeologist who discovers life on a distant planet. She conceals her pain of being unable to have children, although is generally kind and possesses a more androgynous appearance. She prioritizes the safety of others, warning them to leave the planet, while Vickers showed no concern for anyone else.

Throughout the events of *Prometheus* and *Avatar*, it becomes clear that their missions ultimately fail, with more obstacles present than successes. The power dynamics in both movies are symbolic in nature. For instance, Ms. Vickers lacks agency, with the captain and David making most of the decisions along with the rest of the crew. Similarly, in *Avatar*, Dr. Grace's warnings about avoiding a hasty takeover are ignored. Women are once again portrayed as secondary characters, portrayed as strong but not capable of standing on their own. This is in contrast to *The Martian* (Ridley Scott, 2015), where the main character (a man) is stranded on another planet but is able to survive and even grow food, demonstrating his strength and resourcefulness in a place where nothing should be able to grow.

The value of adapting the Greimas Method for this analysis lies in its ability to reveal the narrative sequence and the power dynamics between characters, where men often occupy the central positions and drive the crucial actions that determine the outcome of the story and resolve the central conflict, either through force or audacity. Moreover, in most action and sci-fi movies analyzed, women are portrayed as fighting for maternal reasons, while men are rarely depicted as having a strong connection to family, reinforcing the notion that men are at the center of everything and do not need a backstory or motivation to be the hero or main character.

5. Limitations and future recommendations

The Bechdel test is not enough to provide insights into the representations of women in commercial cinema, despite its worldwide use for this purpose. Therefore, it is necessary to combine elements or create adaptations to other methods to provide in depth insight.

Moving forward, it is crucial to delve deeper into the issue of underrepresentation of women in STEAM fields in cinema. This requires a closer examination of factors such as the gender intersection with ethnicity, age, and gender. It is imperative to shed light on the impact that the lack of positive female role models in cinema has on promoting women's participation in these fields. Future studies could benefit from incorporating theories from behavioral sciences and conducting long-term experiments to assess the extent to which cinema unconsciously shapes our perceptions and attitudes.

Furthermore, it is worthwhile to analyze the impact that the popularity of certain movie genres has on societal movements and issues related to gender and human rights. This can provide valuable insights into the media's influence on these essential subjects.

6. Conclusions

"A useful way to understand characters is by considering them as a unit of psychology and action" (Pérez-Rufí, 2016, p. 538), By analyzing the various circumstances that make up a character in a film, such as their morals, psychology, physicality, and others, we can gain insights into their relationships, power dynamics, agency, and mediations. Moreover, the cinematographic effects interact with the audience as an active participant, leading to relevant conclusions, often without conscious awareness of the thought process. Although the Bechdel test alone provides limited information compared to other methods of analysis, it serves as a starting point for our examination of representation. Furthermore, the fact that only a small number of movies in our sample passed the test, and then went on to be analyzed using the Greimas Actant Method, highlights the need for improvement in terms of representation of female scientific characters in today's commercial cinema.

Despite the current push for the feminism of difference, which has made its way into literature, theater, and cinema, there is still much work to be done in terms of portraying positive and impactful role models for women in STEAM fields. These role models should be liberated from the male gaze and not be centered around pleasing male interests or lifestyles disconnected from the realities of women in STEM. The purpose of this analysis is not to find a message or moral in the films, but rather to highlight the differences in the characterization of characters, the psychological messages being conveyed by filmmakers, and how patriarchal and divisive ideals continue to be

perpetuated, often unconsciously, as future generations shape their role models.

As audiences, it is crucial that we examine the content we consume and the messages it conveys. By being more mindful of the information that enters our belief systems, we can help break away from harmful and outdated gendered attitudes. What we need to see is women scientists portrayed as powerful, independent figures, free from the constraints of family obligations or being defined by their relationships with others. Instead, let there be a celebration to their ambitions, purposes, and personal journey, truly embracing their scientific pursuits as a central aspect of their lives, just as Madame Curie, authentic, irreverent, though, firm in her convictions.

References

- Agarwal, A., Zheng, J., Kamath, Sh., Balasubramanian, S. & Dey, Sh. A. (2015). Key Female Characters in Film Have More to Talk About Besides Men: Automating the Bechdel Test. In *Proceedings of the 2015 Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies*, (830-840). Denver, Colorado: Association for Computational Linguistics. DOI: 10.3115/v1/N15-1084
- Bechdel, A. (1986). *Dykes to Watch Out for*. New York: Firebrand Books.
- Bernárdez, A. (2012). Phallic Female Models of Media Postfeminism: an approach to Millennium, Avatar, and the Hunger Games. *Anàlisi*, (47), 91-112. <https://doi.org/10.7238/a.v0i47.1897>
- Binimelis, M. (2016). Perspectivas teóricas en torno a la representación de las mujeres en el cine: una breve aproximación histórica. *Secuencias*, (42), 9-34. <https://doi.org/10.15366/secuencias2016.42.001>
- Byrne, J., Fattoum, S., & Díaz-García, M. C. (2019). Role Models and Women Entrepreneurs: Entrepreneurial Superwoman Has Her Say. *Journal of Small Business Management*, 57(1), 154-184. <https://doi.org/10.1111/jsbm.12426>
- Butler, J. (1993). *Los cuerpos que importan. Sobre los límites materiales y discursivos del sexo*. Buenos Aires: Ediciones Paidós.
- Camberos, M. T. (2011). *Empoderamiento femenino y políticas públicas, una perspectiva desde las representaciones sociales de género*. *Entramado*, 7(2), 40-53. Retrieved from <https://www.redalyc.org/articulo.oa?id=265422684003>
- Carney, J., Robertson, C. & Dávid-Barret, T. (2019). Fictional narrative as a variational Bayesian method for social dispositions in large groups. *Journal of Mathematical Psychology*, 93, 1-10. <https://doi.org/10.1016/j.jmp.2019.102279>
- De Beauvoir, S. (2015). *El segundo sexo*. Madrid: Cátedra.
- Duque, C. A. (2010). Judith Butler y la teoría de la performatividad de género. *Revista de educación y pensamiento*, (17), 85-95. Retrieved from <https://repositorio.unal.edu.co/handle/unal/53731>
- Eris, O., Chachra, D., Chen, H. I., Shepard, Sh., Ludlow, L., Rosca, C., Bailey, T. & Toye, J. (2010). Outcomes of a longitudinal administration of the persistence in engineering survey. *Journal of Engineering Education*, 99(4), 371-395. <https://doi.org/10.1002/j.2168-9830.2010.tb01069.x>
- European Education and Culture Executive Agency, Eurydice, Bourgeois, A., Zagordo, M. & Antoine, A. (2018). *Entrepreneurship education at school in Europe: Eurydice report*. Luxembourg: Publications Office of the European Union. Retrieved from <https://data.europa.eu/doi/10.2797/301610>
- European Commission, Directorate-General for Education, Youth, Sport and Culture (2014). *A profile of current and future audiovisual audience: final report*. Luxembourg: Publications Office of the European Union. Retrieved from <https://data.europa.eu/doi/10.2766/72130>
- Faber, R., Brown, J. D. & McLeod, J. D. (1979). Coming of Age in the Global Village: Television and Adolescence. In E. Wartella (Ed.), *Children communicating: Media and the development of thought, speech, understanding* (pp. 215-250). Beverly Hills, California: Sage Publications.
- Flicker, E. (2003). Between brains and breasts-women scientist in fiction film: On the marginalization and sexualization of scientific competence. *Public understanding of science*, 12(3), pp. 307-318. <https://doi.org/10.1177/0963662503123>
- García, D., Weber, I. & Rama, V. (June 1-4, 2014). Gender asymmetries in reality and fiction: The Bechdel test of social media. In Eighth International AAAI Conference on Weblogs and social media (ICWSM), (131-140). Ann Arbor, Michigan: AAAI Press. Retrieved from <https://www.aaai.org/ocs/index.php/ICWSM/ICWSM14/schedConf/presentations>
- Greimas, A. J. (1983). *Structural semantics: an attempt at a method*. University of Nebraska Press, (59-77)
- Guarinos, V. (2008). Mujer y cine. En T. Núñez Domínguez & F. Loscertales Abril (Eds.), *Los medios de comunicación con mirada de género* (pp. 103-120). Sevilla: Instituto Andaluz de la Mujer. Retrieved from <http://hdl.handle.net/11441/26775>
- Karataş-Özkan, M. & Chell, E. (2015). Gender inequalities in academic innovation and enterprise: a Bourdieuan analysis. *British Journal of Management*, 26(1), 109-125. <https://doi.org/10.1111/1467-8551.12020>
- Kool, D., Azevedo, N. H. & Avraamidou, L. (2022). The lonely heroine: Portrayal of women scientists in films. *Educational Media International*, 59(2), 150-171. <https://doi.org/10.1080/09523987.2022.2101205>
- Kuschel, K., Lepeley, M. T., Espinosa, F. & Gutiérrez, S. (2017). Funding challenges of Latin American women start-up founders in the technology industry. *Cross Cultural & Strategic Management*, 24(2), 310- 331. <https://doi.org/10.1108/CCSM-03-2016-0072>
- Lauzen, M. M. & Dozier, D. M. (2005). Maintaining the Double Standard: Portrayals of Age and Gender in Popular Films. *Sex Roles*, 52(7), 437-446. <https://doi.org/10.1007/s11199-005-3710-1>

- Luan, L., Liu, W., Zhang, R. & Hu, S. (2022). Introducing Cognitive Psychology in Films Studies: Redefining Affordance. *International Journal of Education and Humanities*, 2(3), 70-78. <https://doi.org/10.54097/ijeh.v2i3.350>
- Markus, H. & Nurius, P. (1986). Possible selves. *American Psychologist*, 41(9), pp. 954-969. <https://doi.org/10.1037/0003-066X.41.9.954>
- Marra, R. M., Rodgers, K. A., Shen, D., & Bogue, B. (2012). Leaving engineering: a multi-year single institution study. *Journal of Engineering Education*, 101(1), pp. 6-27. <https://doi.org/10.1002/j.2168-9830.2012.tb00039.x>
- Marsen, S., Biddle, R. & Noble, J. (2003). *Use Case Analysis with Narrative Semiotics*. J. Ang, Sh.-A. Knight (Eds.), *Proceedings of the Australasian Conference on Information Systems (ACIS 2003)*, (1-8). Joondalup, W. A: We-B Centre. Retrieved from <http://www.mcs.vuw.ac.nz/comp/Publications/CS-TR-03-10.abs.html>
- Martín-Barbero, J. (2002). Medios, mediaciones y tecnologías. *Signo y Pensamiento* 21(41), 13-20. Retrieved from <https://revistas.javeriana.edu.co/index.php/signoypensamiento/article/view/2778>
- Moscovici, S. (1961). *La Psychanalyse, son image et son public*. París: PUF.
- Mulvey, L. (2006). Visual pleasure and narrative cinema. In M. G. Durham & D. M. Kellner (Eds.), *Media and cultural studies: Keywords*, (342-352). Cornwall: Blackwell Publishing.
- Pérez-Ruff, J. P. (2016). Metodología de análisis del personaje cinematográfico: Una propuesta desde la narrativa fílmica. *Razón y palabra*, 20(4_95), 534-552. Retrieved from <https://www.revistarazonypalabra.org/index.php/ryp/article/view/685>
- Saraswati, R. (2022). Greimas's Actantial Model in The Hunger Games Movie. *Akrab Juara: Jurnal Ilmu-Ilmu Sosial*, 7(3), 314-321. <https://doi.org/10.58487/akrabjuara.v7i3.1913>
- Steinke, J. & Paniagua, P. M. (2017). Cultural representations of Gender and STEM: Portrayals of Female STEM Characters in Popular Films 2002-2014. *International Journal of Gender, Science and Technology*, 9(3), 244-277. Retrieved from <https://genderandset.open.ac.uk/index.php/genderandset/article/view/514>
- Shift7 (2017). Report Female-led films outperform at box office for 2014-2017, *Shift7.com*. Retrieved from <https://shift7.com/media-research/#arrow-jump>
- Yang, L., Xu, Z. & Luo J. (2020). Measuring Female Representation and Impact in Films over Time. *ACM/IMS Transactions on Data Science*, 1(4), Article 30, 1-14. <https://doi.org/10.1145/3411213>
- Wang, M. T. & Degol, J. L. (2017). Gender gap in science, technology, engineering, and mathematics (STEM): current knowledge, implications for practice, policy, and future directions. *Educational Psychology Review*, 29(1), 119-140. <https://doi.org/10.1007/s10648-015-9355-x>
- World Economic Forum (2020). *The Future of Jobs. Report*. Cologny/Ginebra, Suiza: World Economic Forum.

Publication 4

8.4. “Social Representations on Lithuanian Women Leaders in the STEAM Fields: A Critical Discourse Analysis”

Social Representations on Lithuanian Women Leaders in the STEAM Fields: A Critical Discourse Analysis

Tatiana Buelvas-Baldiris

Rey Juan Carlos University, Spain
t.buelvas.2020@alumnos.urjc.es
<https://orcid.org/0000-0002-0156-8883>

Rainer Rubira-García

Rey Juan Carlos University, Spain
rainer.rubira@urjc.es
<https://orcid.org/0000-0002-5667-6080>

Rasa Pocevičienė

Šiauliai State University of Applied Sciences, Lithuania
rasa.pocevicienne@svako.lt
<https://orcid.org/0000-0003-2576-6443>

Abstract. Science, technology, engineering, arts, and mathematics (STEAM) are fields substantially crucial for innovation and development. Nevertheless, the gender gap in these areas is significant also in European countries. Considering the underrepresentation of STEAM women's leadership, we provide insight into the common characteristics that led Lithuanian women to become referents in their fields. We identify elements of leadership in discursive social representations, professional ideologies, gender identity and role congruency in connection to power structures from a gender perspective within organisations, considering the mediations of the social context. We conducted the research in two phases: an online questionnaire and in-depth interviews. We performed a critical discourse analysis of Lithuanian Women's testimonies to understand gender social representations. Parenthood highly influences building leadership and choosing STEAM careers, whereas self-efficacy and creativity are essential elements. High co-responsibility at home confirms that family context is vital. In STEAM careers, a male-centric perspective still constrains female leadership. There is still work to be done regarding active politics, programs, and law enforcement to create equity and social justice relationships between men and females, especially in STEAM areas.

Keywords: Women leadership; Social Representations; STEAM; Gender studies; Lithuania

Savęs atstovavimas moterų lyderystėje STEAM srityse Lietuvoje: diskursas, lyties tapatybė ir vaidmenų suderinamumas

Santrauka. Mokslas, technologijos, inžinerija, menai ir matematika (STEAM) – tai sritys, kurios yra labai svarbios naujovėms ir plėtrai, bet taip pat sritys, kuriose labiausiai pasireiškia lygių galimybių spragos, net ir

Received: 2022-06-10. **Accepted:** 2023-07-03.

Copyright © 2023 Antanas Kairys, Vytautas Jurkūvenas, Vita Mikuličiūtė, Viktorija Ivleva, Vilmantė Pakalniškienė. Published by Vilnius University Press. This is an Open Access article distributed under the terms of the [Creative Commons Attribution Licence](https://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Europos šalyse. Atsižvelgiant į tai, kad STEAM moterų lyderystė yra nepakankama, straipsnyje pateikiamos įžvalgos, kokios yra tos bendrosios charakteristikos, padedančios kai kurioms Lietuvos moterims tapti savo srities atstovėmis. Lyderystės elementai buvo nustatyti diskursyviame savęs reprezentavime, tapatybės vaidmenyse ir profesinėse nuostatose, susijusiose su valdymo struktūromis organizacijose iš lyčių perspektyvos, atsižvelgiant į socialinį kontekstą. Tyrimas buvo atliktas dviem etapais: iš pradžių internetinė apklausa, po to giluminiai interviu ir gyvenimo istorijos metodas, derinant kiekybinius ir kokybinius metodus. Vėliau atlikta apklausų dalyvių atsakymų diskurso analizė, siekiant suprasti lyčių savęs reprezentaciją. Tyrimu išsiaiškinta, kad tėvas daro didelę įtaką ugdant lyderystę ir pasirenkant STEAM karjerą, o savarankiškumas ir kūrybiškumas yra vieni svarbesnių elementų šioje srityje. Didelė bendra atsakomybė, vyraujanti namuose, patvirtina, kad šeimos kontekstas yra gyvybiškai svarbus. Kita vertus, STEAM karjeroje vis dar išlieka į vyrus orientuota perspektyva, kuri riboja moterų lyderystę. Vis dar reikalinga aktyvi veikla politikos, edukacinių programų ir socialinio teisingumo srityse, kad būtų sukurti lygybės ir socialinio teisingumo santykiai tarp vyrų ir moterų, ypač STEAM srityse.

Pagrindiniai žodžiai: moterų lyderystė; savęs atstovavimas; STEAM; lyčių tyrimai; Lietuva

Introduction

The underrepresentation of women leadership in Science, Technology, Engineering, Arts and Mathematics (STEAM) can be attributed to various aspects, including stereotype threat, lack of role models, access to tertiary education, lack of inclusive policies, upskilling and reskilling (Verdugo-Castro et al., 2022; Cheryan et al., 2020; EIGE, 2022). Concerning the lack of role models, leadership greatly impacts those who embody it and organisations (Love et al., 2017), as this aspect allows them to become influential individuals to pursue common goals. In this regard, the characterisation of women's leadership in Lithuania in these areas can contribute to understanding the role of social representations in shaping perceptions and expectations in connection with professional ideologies, specifically STEAM areas, which in turn can contribute to reducing such gender inequalities.

There is an increasing body of scientific literature dedicated to the relationship between gender and leadership (Appelbaum et al., 2003; Eagly & Johnson, 1990; Hoyt, 2010), gender differences in multicultural contexts (Eklund et al., 2017), gender and management (Rhee et al., 2015), among others, although few of them focus on the STEAM sector. Researchers across different disciplines constantly seek to understand the challenges women face in the means of leading or succeeding in life (Winny & Joseph, 2021), paying little attention to the intersection of these topics with professional ideology.

Further evidence suggests that women have a unique leadership perspective, are good at decision-making and innovation skills (Cook et al., 2009; Wu et al., 2022), also tend to be more collaborative and inclusive, producing positive and productive work environment (Cook et al., 2014; Eagly et al., 2001). Despite the optimistic assets that women can bring to organisations, barriers appeared to be greater. Phenomena like the glass ceiling (Purcell et al., 2010) and the glass cliff (Velte, 2018) demonstrate that the roots of these issues are structural gender-based inequalities.

By opening safe spaces for women to be in leadership positions in STEAM-based organisations, thanks to their collaborative approach, it is possible to enable other lower rank women to rise too. It is not the same scenario as when women are promoted only

during conflictive times at companies, as their leadership, power and authority can be compromised, confirming that “the glass cliff is especially evident in male-centred sectors” (Ryan et al., 2007, pp.182–197).

The main goal of this research is to provide a characterisation of Lithuanian women leaders in STEAM according to the social representations of their own. We conducted an online questionnaire and in-depth interviews to identify elements through critical discourse analysis that shed light on patterns that can impact leadership. We use these concepts in connection to professional ideologies, identity and congruency roles, for these notions intersect in how knowledge is hierarchised, creating power dynamics that reinforce gender differences and imbalances in STEAM.

Contextual Background

“Lithuania is often seen as a good example of implementing gender equality measures in Europe” (Zalieniė et al., 2013, p. 284). As a result, in 2007, the European Institute of Gender Equality – EIGE was established there. This country, with approximately 2.8 million inhabitants in 2023, has “adopted legislations and laws since 1999 to promote Equal Opportunities between Women and Men; it was one of the first countries in Central and Eastern Europe to do so” (Zalieniė et al., 2013, p. 284). Among the strategic actions towards promoting women in STEAM, L’Oréal Baltic created cooperation with UNESCO Commission to grant awards of 6,000 euros to support excellent female doctoral and postdoctoral researchers from experimental natural sciences and medicine (UNESCO, 2019). From Women in Science Fellowships, several interviews have been done for the purpose of this study, among other risings talents from STEAM in Lithuania.

The effects of the COVID-19 pandemic and the digital transformation in the labour market created the scenario for European countries to develop the Declaration of Ljubljana on Gender Equality in Research and Innovation, adopted by most, including Lithuania. This is a framework to leverage the Gender Equality Strategy for 2020–2025 (Ljubljana Declaration, 2021). This declaration recognises deficiencies in women’s education and access to opportunities in STEAM, which demonstrates the scarcity of qualified profiles to cover STEAM job vacancies in Europe.

The 2022 Gender Equality Index (GEI) results show that “Lithuanians have the highest scores since the 2021 GEI, along with Belgium, Croatia [...]” (EIGE, 2022, p. 19). Compared to other European countries, Lithuania has opened spaces to women in decision-making positions (+6.0 points) and government representatives; in fact, “in early 2022, Lithuania was one of the very few EU Member States with a women prime minister” (EIGE, 2022, p. 47). Nevertheless, 2023 statistics show that 70% of Lithuanian parliament members are male, compared to 28% of women (EIGE website, 2023), which informs about some limitations to overcome, to continue improving gender social policies that impact the STEAM sector.

Despite the lack of research that further informs gender and leadership intersection in STEAM in Lithuania, or if so, written in English. It is thanks to the milestones of this

country in reducing the gender gap that we decided to use it as a study case. Although, this country's size in terms of land and population compared to other Member States, Lithuania's transition to democracy and a market economy was not long ago, and these inequalities were considered non-existent in the Soviet Union (Sipos, 1992; Matkovic et al., 2007), and taboo to researchers (Stubbs et al., 2019), "as it was assumed that communists solved the social problems mentioned before" (Aidukaite et al., 2022, p. 162).

Theoretical Framework

The debate between Science, Technology, Engineering and Mathematics (STEM), and STEAM, including Arts, started from creating a distinction between disciplines conventionally known as "creative", such as music, arts and more, and those disciplines traditionally seen as more rigid and logical-mathematical (Catterall, 2002). We must not forget that most exceptional thinkers ever known in STEAM were creative across disciplines influenced by Art (Root-Bernstein, 2003). The intention to broaden the scope to creative disciplines such as media, making, and digital technology serves the purpose while analysing leadership.

Leadership is the process by which "an individual influences a group of people to achieve a common goal" (Matouq, 2015, p. 3). Although the increasing demand for diversity in career paths, gender discrimination in STEAM leadership remains persistent (Sekiguchi et al., 2022, p. 4). For instance, a survey conducted in 2012 by the Equal Opportunities Ombudsmen Office informs about "gender representation in the Lithuanian academic community recorded results from 22 universities, state and private, informed of men domination among rectors, vice-rectors, senate members and faculty deans. Overall, women had positions at the lowest administrative levels [...]" (Zaleniene et al., 2013, p. 291). Even though the situation has probably changed since 2012, women leaders are necessary to challenge social representations and encourage structural change in these careers.

The Theory of social representation (TSR) is defined as an organised and structured set of cognitions produced and shared by members of the same group about the same social object (Abric, 2001; Moliner et al., 2015). TSR and TPI allow us to understand how identity, gender roles and power dynamics shape STEAM as a sector.

The theory of professional ideologies (TPI) refers to how academic disciplines have been theorised in terms of their exercise of power in classifying, hierarchising and preserving certain forms of knowledge while disregarding others (Foucault, 1977). However, it is difficult to recognise the limits within, between and across disciplines as sometimes they are blurry (Osborne, 2015). However, disciplines form curriculums taught in schools and universities, which become instruments that reinforce class, power, and gender division, as the knowledge is hierarchically organised (Connell, 1993). Consequently, some disciplines are more stereotyped as male-centred than others, directly affecting women's representation and leadership.

For example, "biology, chemistry, and mathematics graduate more women than men in the US" (Cheryan et al., 2017, p.8). Hence, in the EU, 73% of students in Engineering, Manufacturing and Construction disciplines were male (EIGE, 2018).

The theory of role congruency (TRC) refers to gender roles that correspond to a social construct and that derive from the division of specific roles and stereotypes, division of labour, access to resources and more between sexes (Eagly et al., 2002). For example, women are nurses, men are doctors, based on the idea that in health careers, one profession is validated collectively as more relevant than the others and is characterised by specific professional behaviours concerning TPI.

TRC is understood through two main aspects, “the descriptive norms (consensual expectations about behaviour in a given group), secondly the legal norms (consensual expectations about ideal behaviour in a given group)” (Cialdini, 1998, pp. 151–1921), the latter is the main error in advancing women’s leadership in STEAM. For instance, the descriptive and legal norms manifest in society as follows:

Female leadership tend to be “kind”, “altruistic and emotionally expressive”, – making reference to communitarian behaviour; whereas male leadership is “independent”, “dominate”, and “assertiveness”, – indicating more individual leadership behaviours (Eagly, 1991, p. 306).

In the intersection with TPI, the gender role perspectives in STEAM are extensive. Some authors argue that women are somehow forced to adapt to limited opportunities by becoming job-oriented and not career-oriented (Mavin, 2001). Others say that women choose non-STEAM careers more than men, based on their abilities with math (Park et al. 2007). Yet, these ideas ignore the layers of women’s career path in STEAM: access to quality tertiary education, personal motivations, family influence, and cultural aspects.

There is a tendency to face many social dilemmas concerning women’s leadership in STEAM, for all the characteristic roles and expectations assigned by society based on gender. If women are agents of change and perform their leadership role or fail to accomplish what is pre-scripted for most women, they risk being negatively assessed by others (Jun-Yeob, 2020). Similarly, suppose women fail in leading others, even while doing what everyone expects from her. In that case, she will fail either way to meet the ideal expectations of “successful leaders” (Eagly et al., 2002). Thus, the social representation of women leaders in STEAM is important to understand the layers of this career path and allow more women to participate in the sector in the future.

Method

For this study, a critical discourse analysis (CDA) approach was used. “The CDA studies text and talk, emerging from critical linguistics, semiotics [...] is a problem-oriented approach, suitable to study relevant social problems, such as sexism, racism, and other forms of social inequalities” (Van Dijk, 1995, p. 17). This approach focuses analysis of relationships between discourse and society (social cognitions, politics, and culture), which is pertinent considering TSR and TRC are related. By using the CDA, we centre on understanding “group relations of power, dominance and inequalities and the ways these are reproduced or resisted by social group members through text and talk” (Van Dijk, 1995, p. 18). To apply the CDA through text and talk, Van Dijk explains that one

can have key categories that affect the structure and content of the mental model of our object of study. By doing this, patterns of speech fall into general and abstract forms of knowledge, beliefs, opinions, attitudes, and ideologies the group shares.

The following selection criteria determined the sample: women who have studied in STEAM and/or have a leadership position at a STEAM-based company; and/or recognised researcher in such fields; holds a leadership position at a private company or in a political institution regarding STEAM sector. The political level is key, as it can change STEAM laws, legislations, and governmental initiatives.

Accordingly, we surfaced the internet looking for women leaders in Lithuania, results showed international prizes, women who have been featured in the news, or outstanding Lithuanian leaders. Although internet results were general, we stayed with women from STEAM and contacted them via LinkedIn and email to invite them to participate in our study. The sample unit is 18 women from Lithuania, located in the main cities according to results from 2021. From the US 8 informants accepted to participate in the process, first we sent them an email with a Google form with some general questions to know better the informant, from there, we scheduled the in-person or virtual interview, depending on their availability.

The trust and ethical protocol are informed from the beginning to all the informants via email and reinstated in the interviews, we required informed consent, they had the right to withdraw, and we also promised confidentiality, anonymity and strict data management encouraging the use of sensitive and personal information of third parties. We communicated the purpose and goal of the present study, methods, and procedures. Likewise, we remind them throughout the process of our commitment to confidentiality not to disclose any recording or key information that can reveal their identity.

We have used both quantitative and qualitative methods for collecting data as this allows us to understand better the research problem (Creswell, 2003). These methods are very common in social sciences, “depending on what we are investigating sometimes is useful to start with a questionnaire and then, follow up with other specific points on a series of interviews, experiment (...)” (Creswell, 2003). We first applied a Google form with simple factual questions, some opinions, and attitudinal questions, “keeping questions as short and simple as possible to increase the accuracy of responses” (Adams et al., 2008, p. 20). Then, semi-structured interviews were conducted, allowing the interview structure to be flexible so that key issues not identified before emerging in the discussion.

For questionnaires and interviews, a list of categories was established and the questions for both tools were created accordingly. The criteria used to code data and display the results are Professional ideologies, leadership, role congruency and social representation in connection with gender perspectives. Both tools were applied to the 8 candidates who accepted to participate from beginning to end in this study, completing a total of 24h of interviews, 1 month extracting data and 1 additional month to code and interpret. Questionnaire results were analysed and shared in this paper separately, from interview results.

The interviews were conducted in isolated spaces to give them the security of being themselves and expressing their experiences in a safe environment. In only two (2) inter-

views a third person (one of the authors in this paper) was necessary who translated, as it was more comfortable for some of them to speak in Lithuanian. We had key points that need to be discussed, and we addressed them with a list of topics, although, we allowed some questions to flow from the discussion rather than being forced (Adams et al, 2008).

Lastly, through the lens of the critical analysis approach we created a matrix in which we located the categories and direct speech from interviews creating correspondence. Therefore, is possible to find common and divergent patterns between them, creating a contrast worth sharing.

Results

The informants are around 30 to 50 years old, born in Lithuania during or after the Soviet Union. Out of 8 women, 6 had a PhD study and 2 had master's degrees. Their field of work and/or study is Digital Innovation, Technology, Construction, Civil engineering, Mathematics, Transport and urban mobility, Neuroscientist, and communications. They are leaders and they manage resources: teams, budgets, projects, and programs for public and private companies, academic boards, corporate boards, human resources departments, legislative and even the Parliament of Lithuania, the Seimas, leading national strategies in the STEAM sector. The industries in which they were working at the time they participated in this study are transport, military, oil and gas sector, mathematics, and molecular biology. Additionally, 4 of the informants are married, 2 in free partnership, and 2 are single; 6 of them mentioned they speak more than 1 language, the most recurrent cases Lithuanian – native for all, Russian, and English.

Discursive Social Representations from Female Leaders

The opportunity to excel in their fields and demonstrate to themselves, rather than others, that they can be as good as the best professionals and defy “how to be” not adapting to what is “commonly accepted” is the main aim of our informants “my personal mission is to say that IT is not just for a man wearing jumpers. When I started it was like if you are in the IT sector, you must be a dirty girl, not nice dressed and I decided to show that it's not true” (Informant 5). Being feminine by polishing nails, or wearing a dress at a congress or conference, should not be related to women's efficacy in STEAM fields or any area of life, and it is also a confirmation of the cultural constraints they experience.

Additionally, informant 3 shared that “I have been working in positions like managing the company that was producing steel construction, where all my employees have been males”. But also, from the informant's perspective the STEAM sector appears to have conduct codes in Lithuania that delimitate how individuals considering their gender or sex should address as a team leader or member. For instance, Informant 3 describes how she caused a “surprise” when she appeared in meetings where they expected a man as the CEO, as in the steel construction industry it is less frequent that a woman rises, suggesting significant changes must be done to tackle glass ceiling tendency.

From the gender perspective of their agency and social representations, it is relevant to mention that informants tend to take or crave control over the outcomes and challenges as they have sufficient knowledge and expertise to perform high. Additionally, they have a very critical mindset that promotes planning every step to then, receive the expected outcome out of those efforts. As a result, they have a high sense of achievement and responsibility, self-efficacy and vision that is self-imposed, but that fosters to deliver good results with vision as leaders and therefore, improve the quality of life of others with their creations, “I’m an ambitious person, therefore I have the motivation to aim high” (Informant 1). The common pattern in the figure of speech is present in most of the 8 informants, demonstrating how interiorized is to be competitive, where aiming high, comparing themselves with other colleagues and the technification of knowledge, is part of the role play they have in a male-centred industry that is coded in that way.

On the other hand, the confidence of these Lithuanian women leaders in STEAM is strong. They are aware of what they can do, and they test their own emotions, abilities and competencies which allows them to understand that developing new skills takes additional time, “I’m good at logical things via mathematics, physics, films, etc. So, for me writing is hard” (Informant 6). On the other hand, it is not surprising that those results take them to become entrepreneurs, ratifying they can achieve whatever goal they propose. In several interviews, the informants mentioned they never hide their thoughts or emotions, rather they express them assertively to be coherent in leading their teams and reinforcing their character.

In co-relation with the social representations, we must acknowledge the significance of the family, because their parenting style forms the decisions they have made, not only from joining in STEAM, but also how they are. In their Lithuanian families, the mother was very supportive and cared too much about the emotional side of women, whereas the father was more involved in imposing rules and limits, allowing them to experience their singularity within the values, social behaviour and position taught. The kind of parenthood experienced was highly open, with parents most of the time, encouraging women to pursue big goals.

Nevertheless, in 2 informants traditional families’ women were expected to be at home and men at work, living under the Soviet Union that suppressed women despite official postures. In this dichotomy where the “breadwinner” is the father, mothers and daughters tend to value and create their self-image at work in terms of what the father would approve or be proud of, meaning in most cases our informants were not seeking external validation, but instead their father’s approval. Contrasting this idea with TSR, informants have coded themselves not only by what they learnt at home, but also, culture, education, and other external influence, which allow them to find a place where to develop accordingly and succeed, most of the time challenging impostor syndrome and other inadequacy feelings.

In most cases, informants choose to be in such leadership positions, although they had no interest in using public relations tools to enhance their leadership in public spaces. As the nature of the positions they hold, social exposure came as a secondary challenge mainly because they love what they do, but not with the purpose of being validated by others.

Despite this, in the Lithuanian context the dissemination of knowledge in STEAM careers, in public spaces is sometimes considered as bragging, and “they think you are not serious scientists if you have time for this” (Informant 2), this is an interiorized bias taken from the social representation’s constraints imposed to women. To make visible relevant scientific achievements, women and men need to participate in media interventions, therefore it should not be considered a negative practice if the colleague is female.

Professional Ideologies and Leadership in STEAM

By the time we conducted this study, informants had leadership positions in industries that are considered male-centred, as a study described that “males prefer to work with objects, whereas females prefer working with other people” (Su et al. 2009, p. 860), explaining why there are more men than women in these areas. In fact, some of the informants mentioned they did not study STEAM as a first career, but rather later in life, because of the personal opportunities they found to grow in these sectors.

Considering the intersection with professional ideologies, the mixed academic background allowed them to have competencies required to direct and manage teams within STEAM as certain learned behaviours and skills, “I came to the STEAM field randomly, but those experiences and those skills that I have from journalism, they are very important here as well” (Informant 7); which informs about how these fields can intersect in a multidisciplinary approach.

There is a common pattern about how 5 of our informants made the decision to join the STEAM career path, and this is thanks to a positive influence from someone close as the father, mother, siblings or a teacher they admire that encouraged them such as “an amazing and rigorous math teacher. She was a solid, fair and very elegant woman” (Informant 2). Regarding the role models, as women are a minority in some of the STEAM fields, “encouraging and giving broader exposure to successful women STEAM scientists and professionals to visit schools and career days” (Ming-Te et al, 2016, p. 132) serves to reject the stereotypes that these fields are not only for men. Additionally, by the figure of speech used by our informants in this question, the leadership relationship was described as amazing, rigorous, solid, and fair, adjectives that allow them to feel admiration and reflected on what they wanted to become.

The STEAM careers have increased in popularity due to the digital transformation that Covid-19 brought to global economies. Nevertheless, these fields are often seen as complex because of the mathematical background and other technical knowledge, evidence suggests that when comparing mathematically gifted individuals, those with higher math skills relative to verbal skills are more likely to pursue STEAM careers (Wang et al., 2013). Contrasting this affirmation with our results, we found that almost all 8 informants consider that to work and succeed in STEAM, one must have certain skills and technical knowledge that allow you to perform high, as only being relatively good at it, is not enough.

A pattern of validation of attitudes and performance at a very early stage creates stimulation to choose STEAM as a career path in the later years, “back in the school, I was

very good at mathematics, but my love for chemistry started back then. For me chemistry was more intuitive. I'm currently a Neuroscientist" (Informant 1), and "Computer engineering was the only profession I could imagine" (Informant 5). Therefore, validations and cumulative specialization of knowledge sustained over time allow them to develop a natural leadership in STEAM, as every process was intuitive and results-oriented.

In the same order of ideas, specific behaviours that guide professionals from the STEAM-specific fields, the informants had a common interiorized pattern for considering career development as a tournament, with a tendency for perfectionism which allow them to produce high quality as mentioned "I can work fast, and I don't like excuses, I know right away who can work with me or not" (Informant 4), or "unfortunately, women in mathematics are not popular even in the 21st century. Men feel superior in this science. I didn't use any tools to combat them, I worked hard until I achieved recognized results" (Informant 2), demonstrating they felt they needed to prove themselves even more than other colleagues.

The 8 informants demonstrated a desire to succeed driven by the purpose of helping other people to grow next to them, therefore, in the leadership development they mentioned not experiencing any preference for male or female pupils, as they tried to keep the processes objective. Although, they did mention encouraging young girls from universities to apply for their research teams and other initiatives.

One of the questions asked was if they consider themselves innovators in their field and how they nurture creativity to see if they happen to have a connection with any form of arts. Informants mention that they see challenges as opportunities, as they use their own fear as fuel, to pursue the execution of projects that are often risky and highly defiant "I'm not afraid to start unique and original projects and processes again and again" (Informant 4). The informant's activities outside the work-life produced a benefit in terms of creativity stimulation such as gardening, painting, playing music, going to the woods, and practising hunting, even riding a motorbike. To solve work-life problems solutions are often found in spaces where they can disconnect and re-think their approach.

Gender Identity and Role Congruency in STEAM

Informants mentioned they have not felt direct discrimination for being women in STEAM, but rather for being too young in positions of leadership. On special occasions such as meetings with decision-makers, suppliers' negotiation, and factory tours with clients, when the male counterparts asked for the Chief Operating Officer or the CEO, and noticed that was a young woman, our informants mentioned, it was shocking and sometimes, even uncomfortable for some, for instance, "people would come to the company and ask for the manager, see me with the jeans in my 20s. They go back to ask again where the manager is and then realize it was me, I could see the shock there" (Informant 3). The role played would have been performed by a man, suggesting that age and gender intersectionality can be noteworthy as a future variant to combine with leadership and female studies in STEAM.

From the cultural contexts characterised by informants, it is possible to see external judgments that do not necessarily reflect their efficacy as leaders in the field. Understanding the regular processes that a career path has, once a person has demonstrated such abilities and capabilities over performance and consistency in time, it should not be labelled as young in any field, nor even considering the clothing she is wearing.

The culture and social representation patterns are performed by informants showing us some of the gender-role stereotypes transferred from the family and society. For instance, “I receive some advice from my mother saying I can’t show up my cleverness, because then I would not find a husband” (Informant 1), although, at the same time, she concluded, “I don’t think my mum would hold this view today. But 30 years ago, she was just being a good mother”, confirming the impact and influence of culture and gender role critique.

“The stereotype that a man has to earn more because he maintains a family and that good leaders are only men” (Informant 7), such biases and stereotypes are present in all social relationships indistinctly of the sex expression or gender identity of individuals. In Lithuania the historical context influenced the educational system, the labour market and the way society are organized creating a generational gap in equal rights education and normalising what should be rightfully for men and women, making these fields as one managed by men stereotypes.

One key aspect questioned in the interviews was the work-life balance, and how this affected the career path for women in science. In the Lithuanian context, informants who choose to be a mother decided to pause their careers as soon as they got their babies, but this did not stop their careers.

Some of these women give us different perspectives on the same situation, whereas some of the informants claimed to have a supportive partnership that executes the co-responsibility at home. “High achievers mums feel guilty because you are spending too much time at work” (Informant 1), nevertheless the pursuit of balance is always a concern. Women express the need to always seek constantly for balance between work, parenting, and all, as they tend to put everything and everyone else above their own needs.

Regarding co-responsibility, informants tend to have clear limits over each activity they have from home to work issues, and those limits allow them to make decisions every day. It is because of those boundaries that they can support children at home as mothers, and this does not stop them to take on projects, change jobs or to be in leadership positions. This confirms considering the role congruency theory, that what is expected from a woman and what women do, is changing in the way that the new masculinities are now at play, taking upon their roles as co-parents raising their children.

Discussion and Conclusions

The discursive social representations expressed by women leaders in STEAM fields, in Lithuania reveal their determination to excel and challenge stereotypes. They aim to demonstrate that femininity should not be linked to their efficacy in these fields and strive to break cultural constraints. These women display a strong sense of agency, critical

thinking, and a commitment to achieving high standards, as well as, they excel in a male-centred industry through expertise and knowledge. Considering family influence, parents' support and encouragement play a significant role in shaping decisions and self-image while contributing to building a strong character to face traditional gender expectations, in which they have successfully overcome frequent feelings of inadequacy. These leaders value their own achievements over public recognition for their work, although, they also acknowledge the role of media interventions to defy existing biases and promote women's visibility in STEAM careers.

Regarding professional ideologies and leadership in STEAM, informants have found opportunities to grow in mixing academic backgrounds, which gave them diverse skill sets to effectively manage and lead teams. Also, the positive influences from role models, such as teachers or family members played a crucial role in inspiring them to pursue a career path in STEAM. Meanwhile, they exhibit a natural inclination toward leadership and view challenges as opportunities for growth. However, they also experience a heightened sense of competition and perfectionism, feeling the need to prove themselves more than their male counterparts. Nevertheless, their leadership style is focused on achieving results and helping others to grow, they also make room to actively encourage young girls to pursue STEAM fields.

About gender identity and role congruency informants have faced both, direct and indirect discrimination due to their young age in leadership positions. The intersectionality of age and gender can be noteworthy in understanding obstacles women face in leadership roles. Cultural and societal influences sometimes reinforce gender-role stereotypes, but these Lithuanian women challenge and defy these biases. While the work-life balance remains a concern, they have found ways to manage their careers and motherhood, often with the support of their partners. Co-responsibility at home and clear boundaries between work and personal life enable them to pursue their goals without compromising their roles as mothers.

In conclusion, findings suggest that women leaders in STEAM fields in Lithuania are driven by their personal mission to challenge stereotypes, achieve high standards, and make a positive impact. They navigate male-dominated industries with determination and resilience, drawing on their knowledge, expertise, and support systems. Although we do not seek or expect all STEAM sectors to be only women at the top, continued efforts must be done to break down gender barriers, promote diversity and inclusion, as well as opportunities for real growth for women in STEAM.

References

Adams, A., & Cox, A. L. (2008). Questionnaires, in-depth interviews, and focus groups. In P. Cairns & A. L. Cox (Eds.), *Research Methods for Human-Computer Interaction* (pp. 17–34). Cambridge University Press.

Aidukaite, J., & Navicke, J. (2022). The evolution of social policy research in Central and Eastern Europe. In K. Nelson, R. Nieuwenhuis, & M. A. Yerkes (Eds.), *Social Policy in Changing European Societies* (pp. 154–170). Edward Elgar Publishing. <https://doi.org/10.4337/9781802201710.00018>

- Abrie, J.-C. (2001). A structural approach to social representations. In K. Deaux & G. Philogène (Eds.), *Representations of the social: Bridging theoretical traditions* (pp. 42–47). Blackwell Publishing.
- Appelbaum, S. H., Audet, L., & Miller, J. C. (2003). Gender and leadership? Leadership and gender? A journey through the landscape of theories. *Leadership & Organization Development Journal*, 24(1), 43–51. <https://doi.org/10.1108/01437730310457320>
- Catterall, J. S. (2002). The arts and the transfer of learning. In R. J. Deasy (Ed.), *Critical Links: Learning in the arts and student academic and social development* (pp. 151–157). Arts Education Partnership.
- Cialdini, R., & Trost, M. R. (1998). Social influence: social norms, conformity, and compliance. In D. T. Gilbert, S. T. Fiske, & G. Lindzey (Eds.), *The handbook of social psychology* (pp. 151–192). McGraw-Hill.
- Cook, A., & Glass, C. (2009). Between a rock and a hard place: Managing diversity in a shareholder society. *Human Resource Management Journal*, 19(4), 393–412. <https://doi.org/10.1111/j.1748-8583.2009.00100.x>
- Cook, A., & Glass, C. (2014). Women, and top leadership positions: Towards an institutional analysis. *Gender, Work & Organization*, 21(1), 91–103. <https://doi.org/10.1111/gwao.12018>
- Connell, R. W. (1993). *Schools & Social Justice*. Temple University Press.
- Cheryan, S., Ziegler, S. A., Montoya, A. K., & Jiang, L. (2017). Why are some STEM fields more gender-balanced than others? *Psychological Bulletin*, 143(1), 1–35. <https://doi.org/10.1037/bul0000052>
- Cheryan, S., Lombard, E., Hudson, L., Kenghtsagn, L., Plaut, V., & Murphy, M. (2020). Double Isolation: Identity expression threat predicts greater gender disparities in computer science. *Self and Identity*, 19(4), 412–434. <https://doi.org/10.1080/15298868.2019.1609576>
- Creswell, J. W. (2003). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (2nd ed.). SAGE.
- Eklund, K. E., Barry, E. S., & Grunberg, N. E. (2017). Gender and leadership. In A. Alvinus (Ed.), *Gender differences in different contexts* (pp. 129–150). InTech. <http://dx.doi.org/10.5772/65457>
- Eagly, A. H., & Johnson, B. T. (1990). Gender and leadership style: A meta-analysis. *Psychological bulletin*, 108(2), 233–256. <https://doi.org/10.1037/0033-2909.108.2.233>
- Eagly, A. H., & Wood, W. (1991). Explaining sex differences in social behavior: A meta-analytic perspective. *Personality and Social Psychology Bulletin*, 17(3), 306–315. <https://doi.org/10.1177/0146167291173011>
- Eagly, A. H., & Johannesen-Schmidt, M. C. (2001). The leadership styles of women and men. *Journal of Social Issues*, 57(4), 781–797. <https://doi.org/10.1111/0022-4537.00241>
- Eagly, A. H., & Karau, S. J. (2002). Role congruity theory of prejudice toward female leaders. *Psychological Review*, 109(3), 573–598. <https://doi.org/10.1037/0033-295X.109.3.573>
- European Institute of Gender Equality. (2018). *Overview | Gender Statistics Database*. EIGE. <https://eige.europa.eu/gender-statistics/dgs>
- EIGE, European Institute for Gender Equality. (2022). *Gender Equality Index*. Retrieved May 25, 2023, from <https://eige.europa.eu/gender-equality-index/2022/domain/power/LT>
- EIGE, European Institute for Gender Equality. (2022). *Gender Equality Index 2022: The COVID-19 pandemic and care*. Publications Office of the European Union.
- Foucault, M. (1977). *Discipline and punish: the birth of the prison*. Pantheon Books.
- Hoyt, C. L. (2010). Women, men, and leadership: Exploring the gender gap at the top. *Social and personality psychology compass*, 4(7), 484–498. <https://doi.org/10.1111/j.1751-9004.2010.00274.x>
- Kattan, M. M. (2015). *Factors of successful women leadership in Saudi Arabia*. [Doctoral dissertation, Rey Juan Carlos University].

- Kim, J.-Y., Hsu, N., Newman, D. A., Harms, P. D., & Wood, D. (2020). Leadership Perceptions, gender, and dominant personality: the role of normality evaluations. *Journal of Research in Personality, 87*, Article 103984. <https://doi.org/10.1016/j.jrp.2020.103984>
- Ljubljana Declaration. (2021). *Gender Equality in Research and Innovation*. Endorsed final document. Slovenian Presidency of the Council of the European Union official publication.
- Love, E. G., Lim, J., & Bednar, M. K. (2017). The face of the firm: The influence of CEOs on corporate reputation. *Academy of Management Journal, 60*(4), 1462–1481. <https://doi.org/10.5465/amj.2014.0862>
- Matkovic, T., Sucer, Z., & Zrinscak, S. (2007). Inequality, poverty, and material deprivation in new and old members of the European Union. *Croatian Medical Journal, 48*(5), 636–652.
- Mavin, S. (2001). Women's career in theory and practice: time for change? *Women in Management Review, 16*(4), 183–192. <https://doi.org/10.1108/09649420110392163>
- Moliner, P., & Abric, J.-C. (2015). Central core theory. In G. Sammut, E. Andreouli, G. Gaskell, & J. Valsiner (Eds.), *The Cambridge handbook of social representations* (pp. 83–95). Cambridge University Press. <https://doi.org/10.1017/CBO9781107323650.009>
- Osborne, P. (2015). Problematizing disciplinarity, transdisciplinary problematics. *Theory, Culture & Society, 32*(5-6), 3–35. <https://doi.org/10.1177/0263276415592245>
- Park, G., Lubienski, D., & Benbow, C. P. (2007). Contrasting intellectual patterns predict creativity in the arts and sciences: tracking intellectually precocious youth over 25 years. *Psychological science, 18*(11), 948–952. <https://doi.org/10.1111/j.1467-9280.2007.02007.x>
- Purcell, D., MacArthur, K. R., & Samblanet, S. (2010). Gender and the glass ceiling at work. *Sociology Compass, 4*(9), 705–717. <https://doi.org/10.1111/j.1751-9020.2010.00304.x>
- Rhee, K. S., & Sigler, T. H. (2015). Untangling the relationship between gender and leadership. *Gender in Management, 30*(2), 109–134. <https://doi.org/10.1108/GM-09-2013-0114>
- Ryan, M. K., & Haslam, S. A. (2007). The glass cliff: Exploring the dynamics surrounding the appointment of women to precarious leadership positions. *The Academy of Management Review, 32*(2), 549–572. <https://doi.org/10.2307/20159315>
- Root-Bernstein, R. (2003). The art of innovation: Polymaths and the universality of the creative process. In L. Shavanina (Ed.), *International handbook of innovation* (pp. 267–278). Elsevier.
- UNESCO. (2019). *Women in Science: The gender gap in science*. UNESCO Institute for Statistics.
- Sekiguchi, T., & De Cuyper, N. (2022). Addressing new leadership challenges in a rapidly changing world. *Applied Psychology, 1*–10. <https://doi.org/10.1111/apps.12401>
- Sipos, S. (1992). *Poverty Measures in Central and Eastern Europe Before the Transition to the Market Economy* (Special Subseries *Child Poverty in Industrialised Countries*). UNICEF. www.unicef-irc.org/publications/pdf/eps29.pdf
- Su, R., Rounds, J., & Armstrong, P. I. (2009). Men and things, women and people: a meta-analysis of sex differences in interests. *Psychological Bulletin, 135*(6), 859–884. <https://doi.org/10.1037/a0017364>
- Stubbs, P., An, S., & Chubarova, T. (2019). Poverty, inequality and well-being in the global East: Bringing the 'social' back in. In S. An, T. Chubarova, B. Deacon, & P. Stubbs (Eds.), *Social Policy, Poverty, and Inequality in Central and Eastern Europe and the Former Soviet Union: Agency and Institutions in Flux* (pp. 11–43). Columbia University Press.
- Van Dijk, T. (1995). Aims of Critical Discourse Analysis. *Japanese Discourse, 1*, 17–27.
- Velte, P. (2018). Appointing Female CEOs in Risky and Precarious Firm Circumstances. A Review of the Glass Cliff Phenomenon. *Corporate Ownership & Control, 15*(2), 33–43. <https://doi.org/10.22495/cocv15i2art3>

Verdugo-Castro, S., García-Holgado, A., & Sánchez-Gómez, C. (2022). The gender gap in higher STEM studies: A systematic literature review. *Heliyon*, *8*(8), Article e10300. <https://doi.org/10.1016/j.heliyon.2022.e10300>

Wang, M.-T., & Degol, J. L. (2016). Gender Gap in Science, Technology, Engineering and Mathematics (STEM): Current knowledge, Implications for Practice, Policy and Future Directions. *Educational Psychology Review*, *29*(1), 119–140. <https://doi.org/10.1007/s10648-015-9355-x>

Wang, M. T., Eccles, J. S., & Kenny, S. (2013). Not lack of ability but more choice: individual and gender differences in choice of careers in science, technology, engineering, and mathematics. *Psychological science*, *24*(5), 770–775. <https://doi.org/10.1177/0956797612458937>

Winy, S., & Joseph, D. (2021). Gender and leadership: A criterion-focused review and research agenda. *Human Resource Management Review*, *31*(2), Article 100765. <https://doi.org/10.1016/j.hrmr.2020.100765>

Wu, J., Richard, O. C., Triana, M. C., & Zhang, X. (2022). The performance impact of gender diversity in the top management team and board of directors: A multiteam systems approach. *Human Resource Management*, *61*(2), 157–180. <https://doi.org/10.1002/hrm.22086>

Zaleniene, I., Rakauskienė, O. G., & Grigoloviciene, D. (2013). Gender Equality in the Lithuanian System of Education and Science. *European Scientific Journal*, *9*(17), 282–302. <https://doi.org/10.19044/esj.2013.v9n17p%25p>

9. REFERENCES

- Abrams, D., & Hogg, M. A. (2004). Metatheory: Lessons from social identity research. *Personality and Social Psychology Review*, 8(2), 98–106.
- Anand, G., Larson, E. C., & Mahoney, J. T. (2020). Thomas Kuhn on paradigms. *Production and Operations Management*, 29(7), 1650-1657.
- Agarwal, A.; Zheng, J.; Kamath, S.; Balasubramanian, S. & Dey, A. S. (2015). Key Female Characters in Film Have More to Talk About Besides Men: Automating the Bechdel Test. In Proceedings of the 2015 Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies, pages 830–840, Denver, Colorado. Association for Computational Linguistics. Doi: 10.3115/v1/N15-1084
- Ball, K., Green, N., Koskela, H., & Phillips, D.J. (2009). Surveillance Studies Needs Gender and Sexuality. *Surveillance & Society* 6(4): 352-355.
- Barbero, M. J. (2002). Pistas para entre-ver medios y mediaciones. *Signo y pensamiento*, 21(41), 13-20. Available in: <https://revistas.javeriana.edu.co/index.php/signoypensamiento/article/view/2778>
- Beddoes, K., Pawley, A. (2014). Different people have different priorities: work-family balance, gender and the discourse of choice. *Studies in Higher Education*, 39 (9), 1573-1585. Doi: 10.1080/03075079.2013.801432
- Beddoe, L. (2013). Health social work: Professional identity and knowledge. *Qualitative Social Work*, 12(1), 24–40. Doi: 10.1177/1473325011415455
- Berryman, S.E., (1983). Who Will Do Science? Minority and Female Attainment of Science and Mathematics Degrees: Trends and Causes. Rockefeller Foundation.
- Bian, L., Leslie, S. J., Murphy, M. C., & Cimpian, A. (2018). Messages about brilliance undermine women’s interest in educational and professional opportunities. *Journal of Experimental Social Psychology*, 76, 404–420.
- Botella, C., Rueda, S., López-Iñesta, E., & Marzal, P. (2019). Gender diversity in STEM disciplines: A multiple factor problem. *Entropy*, 21(1), 30. DOI: 10.3390/e21010030
- Bourdieu, P., Chamboredon, J.C., Passeron, J.C. (1991). *The Craft of Sociology*. Walter de Gruyter. Berlín, English Ed. ISBN: 0-89925-870-0
- Braithwaite, M. (1999). ‘Mainstreaming Equal Opportunities into the Structural Funds: How Regions in Germany, France and the United Kingdom are Putting into Practice the New Approach. In Final Report of the survey of current practice and findings of the seminar at Gelsenkirchen, pp. 21-22.
- Castells, C. (1996). *Perspectivas feministas en teoría política*. Barcelona: Paidós. ISBN 84-493-0339-7.
- Carr, P. L., Helitzer, D., Freund, K., Westring, A., McGee, R., Campbell, P. B., & Villablanca, A. (2019). A summary report from the research partnership on women in science careers. *Journal of general internal medicine*, 34, 356-362.
- Chandler, D. (2002). *The basics*. London: Routledge.
- Chafetz, J. S. (2006) *Handbooks of the Sociology of Gender*. Springer Science & Business Media, pp. 630. ISBN 0387362185, 9780387362182
- Cheryan, S., Ziegler, S.A., Montoya, A.K., Jiang, L., (2017). Why are some STEM fields more gender balanced than others? *Psychol. Bulletin* 143 (1), 1–35.

- Cheryan, S., Plaut, V. C., Davies, P. G., & Steele, C. M. (2009). Ambient belonging: How stereotypical cues impact gender participation in computer science. *Journal of Personality and Social Psychology*, 97, (6), 1045–1060.
- Cheryan, S., Lombard, E., Hudson, L., Kengthasagn, L., Plaut, V. and Murphy, M. (2020). Double Isolation: Identity expression threat predicts greater gender disparities in computer science. *Self and Identity*, 19 (4), 412-434.
- Craft, A., Jeffrey, B., & Leibling, M. (Eds.). (2001). Creativity in education. A&C Black.
- Creswell, J.W. (2003). Research design: Qualitative, quantitative, and mixed methods approach, 2nd edn. *Thousand Oaks, CA: Sage*.
- Commission of the European Communities (1996). 'Communication from the Commission: Incorporating Equal Opportunities for Women and Men into All Community Policies and Activities', COM (96) 67 final of 21 February 1996. Available in: <https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:1996:0067:FIN:EN:PDF>
- Coburn, D., D'Arcy, C. & Torrance, G. (1998). Health and Canadian Society: Sociological Perspectives. Information and Interdisciplinary Subjects Series. Illustrada, University of Toronto Press, pp. 638. ISBN 0802080529, 9780802080523
- Connell, R. W., & Connell, R. (1993). Schools & social justice (No. 12). James Lorimer & Company.
- Cornett, M.; Palermo, C.; Ash, S. (2023). Professional identity research in the health professions -a scoping review. *Advances in Health Science Education*, 28: 589-642. Doi: 10.1007/s10459-022-10171-1
- Denend, L., Mccutcheon, S., Regan, M., Sainz, M., Yock, P., & Azagury, D. (2020). Analysis of Gender Perceptions in Health Technology: A Call to Action. *Annals of Biomedical Engineering*, 48(5),1573–1586. DOI: 10.1007/s10439-020-02478-0
- Duch J, Zeng XHT, Sales-Pardo M, Radicchi F, Otis S, Woodruff TK, et al. (2013) Correction: The Possible Role of Resource Requirements and Academic Career-Choice Risk on Gender Differences in Publication Rate and Impact. *PLoS ONE* 8(5). Doi: 10.1371/annotation/7f54a3e6-6dcf-4825-9eb9-201253cf1e25
- EBSCO (2023). About Academic Search Ultimate database. EBSCO Information Services. Available online: www.ebsco.com
- European Commission, EC. (2005). Decision of the European Parliament and of the Council: Concerning the seventh framework programme of the European Community for research, technological development, and demonstration activities. 2005/0043 (COD), COM (2005) 119 final. Brussels, 06/04/2005. Available in: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2005%3A0119%3AFIN>
- European Commission, EC. (2022). Proposal for a Decision of the European Parliament and of the Council on a European Year of Skills 2023. Available in: <https://eurlex.europa.eu/legalcontent/EN/TXT/PDF/?uri=CELEX:52022PC0526>
- European Parliament, EP. (2021). European Parliament resolution of 10 June 2021 on promoting gender equality in Science, Technology, Engineering, and Mathematics (STEM) education and careers (2019/2164 (INI)). Available in: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021IP0296>

- Ellis, J., Fosdick, B.K., Rasmussen, C. (2016). Women 1.5 Times More Likely to Leave STEM Pipeline after Calculus Compared to Men: Lack of Mathematical Confidence a Potential Culprit. *PLOS ONE*, 11:7. Doi: 10.1371/journal.pone.0157447 PMID: 27410262
- EIGE, European Institute for Gender Equality (2022) Gender Equality Index, The COVID-19 pandemic and care. Vilnius: Publications Office of the European Union. Doi: 10.2839/035888
- Fagermoen, M. S. (1997). Professional identity: Values embedded in meaningful nursing practice. *Journal of Advanced Nursing*, 25(3), 434–441. Doi: 10.1046/j.1365-2648.1997.1997025434.x
- Fine, G. A., & Sandstrom, K. (1993). Ideology in Action: A Pragmatic Approach to a Contested Concept. *Sociological Theory*, 21–38. Doi: 10.2307/201978
- Foucault, M. (1977). Discipline and punish: the birth of the prison. 1st American ed. Pantheon Books.
- García-Holgado, A., Mena, J., García-Peñalvo, F. J., Pascual, J., Heikkinen, M., Harmoinen, S., García-Ramos, L., Peñabaena-Niebles, R., Amores, L. (2020) Gender equality in STEM programs: a proposal to analyse the situation of a university about the gender gap. In 2020 IEEE Global Engineering Education Conference (EDUCON) (pp. 1824-1830). IEEE.
- García-Holgado, A; Verdugo-Castro, S; González, C; Sánchez-Gómez, M.C, & García-Peñalvo, F. J. (2020A). European Proposals to Work in the Gender Gap in STEM: A Systematic Analysis. *IEEE Revista Iberoamericana de Tecnologías del Aprendizaje*, 15(3), 215-224. Doi: 10.1109/RITA.2020.3008138
- García-Holgado, A.; Verdugo-Castro, S.; Sánchez-Gómez, M.C. & García-Peñalvo, F. (2019). Trends in studies developed in Europe focused on gender gap in STEM. In Proceedings of XX International Conference on Human-Computer Interaction. ACM, New York, NY, USA, 1-8. Doi: 10.1145/3335595.3335607
- García-Holgado, A; Marcos-Pablos, S; García-Peñalvo, J. (2020B). Guidelines for performing Systematic Research Projects Reviews. *International Journal of Interactive Multimedia and Artificial Intelligence*, 6 (6). Doi: 10.9781/ijimai.2020.05.005
- García, D., Weber, I., & Garimella, V. (2014). Gender asymmetries in reality and fiction: The Bechdel test of social media. In Proceedings of the International AAAI Conference on Web and social media, 8 (1), 131-140.
- Gieryn, T. (1983). Boundary-work and the Demarcation of Science from Non-Science: Strains and interests in Professional Ideologies of Scientists. *American Sociological Review*, 48(6), 781–795. Doi: 10.2307/2095325
- Gjersoe, N. (2018) “Bridging the gender gap: why do so few girls study STEM subjects?”, The Guardian's Psychology Head quarters, UK.
- Glover, J. (2000) Women and Scientific Employment. *Springer*. Doi: 10.1057/9780333981085.
- Halvorsen, H., Tretjakova, R., Timmerberg, J., Thiriet, J., & Mylvaganam, S. (2019). STEAM for STEM - Include “Art” in STEM (Science, Technology, Engineering and Mathematics). 2019 29th Annual Conference of the European Association for Education in Electrical and Information Engineering (EAEEIE), 1-7. Doi: 10.1109/EAEEIE46886.2019.9000460
- Haraway, D. (1978). Animal sociology and a natural economy of the body politic, Parts 1 and 2. *Signs: Journal of Women in Culture and Society*, 4 (1), 21-36; 37-60.

- Haraway, D. (1988). Situated knowledges: the science question in feminism and the privilege of partial perspective. *Feminist Studies*, 14(3), 575–599. Doi: 10.2307/3178066
- Harding, S., & Hintikka, M.B. (Eds.) (1983). Discovering reality: Feminist perspectives on epistemology, metaphysics, methodology, and philosophy of science. *Springer Science & Business Media*, 161.
- Harding, S. (1998). Is science multicultural? Postcolonialisms, feminisms, and epistemologies. Indiana University Press.
- Hébert, L. (2011). Tools for text and image analysis: An introduction to applied semiotics. Translated from the French version by Julie Tabler, version, 3, 2011.
- Hill, C., Corbett, C., & St. Rose, A. (2010). Why so few? Women in science, technology, engineering, and mathematics. American Association of University Women. 1111 Sixteenth Street NW, Washington, DC 20036.
- Hickey, W., Koeze, E., Dottle, R., & Wezerek, G. (2017). The Next Bechdel Test'. Five Thirty-Eight.
- Hogg, M. A., Terry, D. J., & White, K. M. (1995). A tale of two theories: A critical comparison of identity theory with social identity theory. *Social Psychology Quarterly*, 255–269.
- Holman, L., Stuart-Fox, D., & Hauser, C.E. (2018) The gender gap in science: how long until women are equally represented? *Plos Biol*, 16 (4), p. e2004956. Doi: 10.1371/Journal.pbio.2004956
- Jackson LA, Gardner PD, Sullivan LA (1993) Engineering persistence: past, present, and future factors and gender differences. *Higher Educ* 26(2), 227–246.
- Jemielniak, D. (2008). Software engineers or artists? Programmers' identity choices. *Tamara: Journal for Critical Organization Inquiry*, 7(1), 20–36.
- Kaplan-Sayi, A., Yurtseven, N., Karadeniz, S. & Vatanartiran, S. (2023) Unraveling the situation of Women in STEM areas from the European teacher perspective: Insights from FEMALES project. *The Qualitative Report*, 28 (5), 1429-1452. Doi: 10.46743/2160-3715/2023.5855
- Kitchenham, B., Budgen, D., Brereton, O.P. (2011) "Using mapping studies as the basis for further research: A participant-observer case study. *Information and Software Technology*, 53(6), 638-651.
- Kitchenham, B., Brereton, O. P., Budgen, D., Turner, M., Bailey, J., Linkman, S., (2009). "Systematic literature reviews in software engineering – A systematic literature review," *Information and Software Technology*, 51 (1), 7-15. Doi: 10.1016/j.infsof.2008.09.009.
- Krippendorff, K. (2018). Content analysis an introduction to its methodology (Fourth). SAGE publications. Available in: <http://www.vlebooks.com/vleweb/product/openreader?id=none&isbn=9781506395678>.
- Koskela, H. (2012). "You shouldn't wear that body": the problematic of surveillance and gender. In *Routledge handbook of surveillance studies*, pp. 49-56. Routledge.
- Kuschel, K., Ettl, K., Diaz-García, C., Alsos, G. A. (2020). Stemming the gender gap in STEM entrepreneurship– insights into women's entrepreneurship in science, technology, engineering, and mathematics. *International Entrepreneurship and Management Journal*, 16, 1-15. DOI: 10.1007/s11365-020-00642-5
- Leslie, L.L., McClure, G.T., Oaxaca, R.L. (1998). Women and minorities in science and engineering, a life sequence analysis. *The journal of higher education*, 69(3), 239-276.

- Levy, Y., and Ellis, T. J. (2006). "A Systems Approach to Conduct an Effective Literature Review in Support of Information Systems Research." *Informing Science*, 9.
- Lips, H. M. (2020). *Sex and gender: An introduction*. Waveland Press, 734. ISBN 1478645032, 9781478645030.
- Longino, H. E. (1990). *Science as social knowledge: Values and objectivity in scientific inquiry*. Princeton University Press.
- London, B., Rosenthal, L., Gonzalez, A. (2011). Assessing the Role of Gender Rejection Sensitivity, Identity and Support on the Academic Engagement of Women in Nontraditional Fields using Experience Sampling Methods. *Journal of Social Issues*, 67 (3), 510-530.
- Mayo, M., Kakarika, M., Pastor, J.C., Brutus, S. (2012). Aligning or inflating your leadership self-image? A longitudinal study of responses to peer feedback in MBA teams. *Academy of Management Learning and Education*, 11(4), 631-652. Doi: 10.5465/amle.2010.0069
- Makarem, Y., & Wang, J. (2020). Career experiences of women in science, technology, engineering, and mathematics fields: A systematic literature review. *Human Resource Development Quarterly*., 31(1), 91–111. DOI: 10.1002/hrdq.21380
- Meyer, M., Cimpian, A., & Leslie, S. J. (2015). Women are underrepresented in fields where success is believed to require brilliance. *Frontiers in Psychology*, 6, 235.
- Mertens, D. M. (2012). Transformative mixed methods: Addressing inequities. *American Behavioural Scientist*, 56(6), 802–813. Doi: 10.1177/0002764211433797
- Mertens, D. M. (2019). *Research and evaluation in education and psychology: Integrating diversity with quantitative, qualitative, and mixed methods* (5th ed.). Sage Publications.
- Nelen, S. (1997) 'Three challenges for the future of the European Union's gender policy examined: the Intergovernmental Conference, Kalanke, and mainst reaming'. College of Europe, Bruges.
- Neuman, W. L. (2007). Basics of social research. Available in: https://ds.amu.edu.et/xmlui/bitstream/handle/123456789/10270/Basics_of_Social_Research__Qualitative_and_Quantitative_Approaches__2nd_Edition_.pdf?sequence=1&isAllowed=y
- Niemi, A., & Paasivaara, L. (2007). Meaning contents of radiographers' professional identity as illustrated in a professional journal—A discourse analytical approach. *Radiography*, 13(4), 258–264.
- Moore, H. & Sanders, T. (2014). *Anthropology in Theory: Issues in Epistemology*. John Wiley & Sons. ISBN: 978-0-470-67335-5.
- Nicholson, E. (2015) "Accounting for career breaks", *Science*, 348 (6236), 830-830. Doi: 101126/science.348.6236.830
- OECD (2012) *Closing the Gender Gap: Act Now*. Paris: OECD Publishing.
- O'Meara, J. (2016). What "The Bechdel Test" doesn't tell us: examining women's verbal and vocal (dis) empowerment in cinema. *Feminist media studies*, 16(6), 1120-1123. DOI: 10.1080/14680777.2016.1234239
- Petersen, K., Feldt, R., Mujtaba, S., & Mattsson, M. (2008). Systematic mapping studies in software engineering. In 12th International Conference on Evaluation and Assessment in Software Engineering (EASE), 12 , 1-10.

- Petersen, K., Vakkalanka, S., Kuzniarz, L. (2015) "Guidelines for conducting systematic mapping studies in software engineering: An update," *Information and Software Technology*, 64, 1-18. Doi: 10.1016/j.infsof.2015.03.007.
- Pollack, M.A. & Hafner-Burton, E. (2000) Mainstreaming gender in the European Union. *Journal of European Public Policy*, 7:3, 432-456, DOI: 10.1080/13501760050086116
- Popkewitz, T.S. & Brennan, M.T. (1997). Foucault's Challenge: Discourse, Knowledge, and Power in Education. Teachers College Press, pp. 409. ISBN: 0807776467, 9780807776469.
- Radcliffe-Brown, A. R. (1941). The study of kinship systems. *The Journal of the Royal Anthropological Institute of Great Britain and Ireland*, 71(1/2), 1-18.
- Rees, T. (1998) Mainstreaming Equality in the European Union: Education, Training, and Labor Market Policies. In *Women's Studies International Forum* (Vol. 21, No. 6, pp. 696-697). Elsevier Science Publishing Company, Inc.
- Ricci, A., Crivellaro, F., & Bolzani, D. (2021). Perceived Employability of Highly Skilled Migrant Women in STEM: Insights from Labor Market Intermediaries' Professionals. *Administrative Sciences*, 11 (1), 7.
- Rose, N. (1990). *Governing the soul: The shaping of the private self*. Taylor & Frances/Routledge.
- Rübsamen-Waigmann, H., Sohlberg, R., Rees, T. L., Berry, O., Bismuth, P., D'Antona, R., & Winslow, D. (2003). Women in industrial research: a wake up call for European industry: A report to the European Commission from the High Level Expert Group on Women in Industrial Research for strategic analysis of specific science and technology policy issues (STRATA). Available online: http://www.genderportal.eu/sites/default/files/resource_pool/KINA20814ENC_002.pdf
- Runco, M. A. (2014). *Creativity: Theories and themes: Research, development, and practice*, 152.
- Rubira-García, R; Baldiris-Navarro, S; Venet-Gutierrez, J and Magro-Vela, S. (2020). Theoretical Aspects of Scholarly Publishing about the Internet in Spanish Communication Journals. *Publications*, 8 (42). Doi: 10.3390/publications8030042
- Saraswati, R. (2022). Greimas's Actantial Model in The Hunger Games Movie. *Akrab Juara: Jurnal Ilmu-Ilmu Sosial*, 7(3), 314-321. Doi: 10.58487/akrabjuara.v7i3.1913
- Shaw, A. K. & Stanton, D. E. (2012) Leaks in the pipeline: separating demographic inertia from ongoing gender differences in academia, *Proceedings of the Royal Society B: Biological Sciences*, 279 (1743), 3736-3741, 2012. Doi: 10.1098/rspb.2012.0822.
- Scheiner-Fisher, C. & Russell III, W.B. (2012). Using historical films to promote gender equity in the history curriculum. *The Social Studies*, 103 (6): 221-225.
- Schetzler, J.M., Smith, J.C., (2014) "Elite male faculty in the life sciences employ fewer women", *Proceedings of the National Academy of Sciences*, 111 (28), 10107-10112. Doi: 10.1073/pnas.1403334111
- Schlenker, E. (2015). The labour supply of women in STEM. *IZA Journal of European Labor Studies*, 4, 1-17. DOI: 10.1186/s40174-015-0034-1
- Silim, A. & Crosse, C. (2014) "Women in Engineering Fixing the Talent Pipeline", Institute for Public Policy Research, September 2014.
- Steinke, J., & Tavaréz, P. M. P. (2017). Cultural representations of gender and STEM: Portrayals of female STEM characters in popular films 2002-2014. *International*

- Journal of Gender, Science and Technology*, 9(3), 244-277. Available in: <https://genderandset.open.ac.uk/index.php/genderandset/article/view/514>
- Taylor, S. J., & Bogdan, R. (1987). *Introducción a los métodos cualitativos de investigación*, 1. Barcelona: Paidós.
- Templier, M., & Paré, G. (2015). A framework for guiding and evaluating literature reviews. *Communications of the Association for Information Systems*, 37(1), 6.
- Tsouroufli, M., Rees, C. E., Monrouxe, L. V., & Sundaram, V. (2011). Gender, identities and intersectionality in medical education research. *Medical Education*, 45(3), 213–216.
- Urry, J. (1973). Thomas S. Kuhn as Sociologist of Knowledge. *The British Journal of Sociology*, 24(4), 462–473. Doi: 10.2307/589735
- UNESCO. Division for Science Policy, & Sustainable Development. (2007). *Science, technology and gender: An international report*. Unesco Publishing. Available in: www.copernicus.eu/sites/default/files/2018-10/FP7.pdf
- UNESCO (2016) Executive Board Decisions Adopted at its 199th Session. Paris, May 16th of, 2016. Available online: <https://unesdoc.unesco.org/>
- Van Dijk, T. (1995). Aims of Critical Discourse Analysis. *Japanese Discourse*, 1, 17-28.
- Wang, M. T., & Degol, J. L. (2017). Gender gap in science, technology, engineering, and mathematics (STEM): Current knowledge, implications for practice, policy, and future directions. *Educational psychology review*, 29, 119-140.
- Wahrenburg, M., Weldi, M. (2007) Return on investment in higher education – evidence for different subjects, degrees and gender in Germany. Johann Wolfgang Goethe Univ., Chair of Banking and Finance.
- Wyatt, T. R., Balmer, D., Rockich-Winston, N., Chow, C. J., Richards, J., & Zaidi, Z. (2021). ‘Whispers and shadows’: A critical review of the professional identity literature with respect to minority physicians. *Medical education*, 55(2), 148-158. Doi: 10.1111/medu.14295
- Xiao, Y., & Watson, M. (2019). Guidance on Conducting a Systematic Literature Review. *Journal of Planning Education and Research*, 39(1), 93–112. Doi: 10.1177/0739456X17723971
- Zaleniene, I., Rakauskienė, O.G., Grigoloviciene, D. (2013). Gender Equality in the Lithuanian System of Education and Science. *European Scientific Journal*, edition 9 (17).

10. ANEXXES

Publication 1 “Scholarly Discourse about Women in the STEAM Fields: An Exploratory Study on Scientific Literature”.

TECHNICAL DATA	
Authors: Tatiana Buelvas-Baldiris ¹ , Rainer Rubira-García ^{2*} , Rasa Pocevičienė ³ .	
Title: “Scholarly Discourse about Women in the STEAM Fields: An Exploratory Study on Scientific Literature”	
Book Title: “Investigación en Contextos Educativos Formales, no Formales e Informales: Descubriendo Nuevos Horizontes en la Educación”	
Volumen: N/A Number: 91	
Editorial: Dykinson S. L.	
Country: Spain	
Year: 2023	
Pages: 919-929	
ISBN: 978-84-1170-560-8	
Link: http://www.editorialdykinson.com/	
Quality criteria: Dykinson 3rd editorial position- ICEE General, 2022, Q1.	

Authors contributions	
Concept and design:	Tatiana Buelvas-Baldiris ¹ , Rainer Rubira-García ²
Methods:	Tatiana Buelvas-Baldiris ¹ , Rainer Rubira-García ^{2*}
Discussion and conclusions:	Tatiana Buelvas-Baldiris ¹ , Rainer Rubira-García ^{2*} , Rasa Pocevičienė ³ .
Writing, format, last draft revision and approval:	Tatiana Buelvas-Baldiris ¹ , Rainer Rubira-García ^{2*} , Rasa Pocevičienė ³ .

Prestigio de las editoriales según expertos españoles. Clasificación general 2022

Editoriales españolas

Posición	Editorial	ICEE
1	Tirant lo Blanch (Grupo editorial Tirant lo Blanch)	1096
2	Aranzadi (Aranzadi LA LEY / Karnov Group)	760
3	Dykinson	758
4	McGraw Hill	541
5	Alianza (Grupo Anaya, Hachette Livre)	530
5	Pirámide (Grupo Anaya, Hachette Livre)	530
6	Cátedra (Grupo Anaya, Hachette Livre)	525
6	Comares	525
7	Marcial Pons	521
8	Síntesis	487
9	Akal (Grupo Akal)	442
10	Consejo Superior de Investigaciones Científicas (CSIC)	411
11	Tecnos (Grupo Anaya, Hachette Livre)	390
12	Ariel (Grupo Planeta)	379
13	Civitas (Aranzadi LA LEY / Karnov Group)	274
14	Pearson Educación	204
15	ESIC Editorial	192
16	Iberoamericana Vervuert	182
17	La Ley (Aranzadi LA LEY / Karnov Group)	174
18	Elsevier España	167
19	Editorial Universidad de Granada	165
19	Octaedro	165
20	Gredos (Grupo RBA)	164
20	Publicacions de la Universitat de València – PUV	164
21	Crítica (Grupo Planeta)	163
22	Prentice Hall Iberia	156
23	Arco Libros – La Muralla	142
24	Atelier	138
25	Paidós (Grupo Planeta)	137
26	Iustel	132
27	Graó Editorial	126
28	Siglo XXI de España Editores (Grupo Akal)	124
29	Trea	123
30	Gedisa	122
31	Sílex Ediciones	115
32	Los Libros de la Catarata	112
33	Centro de Investigaciones Sociológicas (CIS)	106
33	Ediciones Universidad de Salamanca	106
34	Editorial UOC	104
35	Trotta	101
36	Editorial Universidad de Sevilla	96
37	Ediciones Complutense	93
38	Bellaterra Edicions	89
39	Instituto de Estudios Fiscales (IEF)	86
40	Visor Libros	83
41	Ediciones Paraninfo	80
42	Abada Editores	78
43	Morata	77
44	Bosch (Aranzadi LA LEY / Karnov Group)	76
45	Narcea	74
46	Anthropos Editorial	72
47	Icaria Editorial	70
48	EUNSA. Ediciones Universidad de Navarra	68
48	Laborum Ediciones	68

Editoriales extranjeras

ICEE	General	Editorial	ICEE
Posición	Posición		General
1096		Oxford University Press	1243
760	1	Routledge (Taylor & Francis Group)	1126
758	2	Cambridge University Press	1099
541	3	Springer	950
530	4	Elsevier	497
530	5	McGraw Hill	416
525	6	Wiley-Blackwell	416
525	6	Peter Lang Publishing Group	350
521	7	Brill	324
487	8	Thomson Reuters	313
442	9	Palgrave Macmillan	305
411	10	Sage Publications	305
411	10	Taylor & Francis (Taylor & Francis Group)	255
390	11	Brepols Publishers	239
379	12	De Gruyter	235
379	12	Harvard University Press	230
274	13	Emerald	200
274	13	Giuffrè	183
204	14	Prentice Hall	168
204	14	John Benjamins Publishing Company	141
192	15	MIT Press	132
192	15	Universidad Nacional Autónoma de México (UNAM)	128
182	16	Fondo de Cultura Económica (México)	119
182	16	Iberoamericana Vervuert	118
174	17	Chicago University Press	109
174	17	Pearson Publishing	102
167	18	Presses Universitaires de France (PUF)	98
167	18	Wolters Kluwer International	93
165	19	IGI Global	90
165	19	Dalloz	89
165	20	Edward Elgar Publishing	81
164	21	Kluwer Academic Publishers (Wolters Kluwer)	80
164	21	L'Harmattan	74
164	22	Academic Press (Elsevier)	72
163	23	C. H. Beck	67
163	23	Princeton University Press	65
156	24	California University Press	62
156	24	Yale University Press	60
142	25	Gallimard	59
142	25	Reichenberger	57
138	26	Bloomsbury	55
138	26	Cedam (Wolters Kluwer)	53
137	27	Porrúa	48
137	27	Clarendon Press (Oxford University Press)	46
132	28	Nova Science Publishers	39
132	28	Columbia University Press	38
126	29	HumanKinetics	
126	29	Giapicchelli	
124	30	Il Mulino	33
124	30	Electa (Mondadori)	31
123	31	Colegio de México	30
123	31	Edinburgh University Press	30
122	32	Stanford University Press	30
122	32	Viella	30
115	33		
115	33		
112	34		
112	34		
106	35		
106	35		
106	36		
106	36		
104	37		
104	37		
101	38		
101	38		
96	39		
96	39		
93	40		
93	40		
89	41		
89	41		
86	42		
86	42		
83	43		
83	43		
80	44		
80	44		
78	44		
78	44		
77	45		
77	45		
76	46		
76	46		
74	47		
74	47		
72	48		
72	48		
70	48		
70	48		
68	48		
68	48		
68	48		
68	48		

Publication 2: “European Projects on Women in STEAM Sectors: Assessing Gender Gap in Science”.

TECHNICAL DATA	
Authors: Tatiana Buelvas-Baldiris, Rainer Rubira-García, Rasa Poceviciené	
Title: “EU Projects on Women in STEAM Sectors: Assessing Gender Gap in Science”	
Book Title: Ensayos Ciberfeministas	
Volumen: N/A Number: N/A	
Editorial: Dykinson S. L.	
Country: Spain	
Year: 2023	
Pages: Not available yet	
ISBN: 978-84-1170-357-4	
Link: http://www.editorialdykinson.com/	
Quality criteria: Dykinson 3rd editorial position- ICEE General, 2022, Q1.	

Authors contributions	
Concept and design:	Tatiana Buelvas-Baldiris ¹ , Rainer Rubira-García ¹
Methods:	Tatiana Buelvas-Baldiris ¹ , Rainer Rubira-García ¹
Discussion and conclusions:	Tatiana Buelvas-Baldiris ¹ , Rainer Rubira-García ¹ , Rasa Poceviciené ²
Writing, format, last draft revision and approval:	Tatiana Buelvas-Baldiris ¹ , Rainer Rubira-García ¹ , Rasa Poceviciené ²



**III Congreso Internacional Feminismo Digital
«Los Derechos de la Mujeres en la era de Internet»
27 y 28 de julio de 2023**

El Sr. D. Francisco Anaya Benítez, Secretario Técnico del Congreso.

INFORMA

Que el capítulo de libro titulado: "Mujeres en los ámbitos STEAM: un análisis desde los proyectos europeos para el impulso de políticas científicas feministas.", del autor/a, Tatiana Buelvas Baldiris, se encuentra incluido en la publicación: "Ensayos ciberfeministas", con ISBN reservado "978-84-1170-357-4".

Dicha publicación se encuentra en estos momentos en proceso de edición, por la editorial Dyckinson S.L., teniendo prevista su publicación para finales de diciembre de 2023

Dicho libro es fruto de una compilación de investigaciones originales que han superado una doble revisión por pares ciegos en su fase de aceptación de propuestas.

Y para que así conste, se firma el presente certificado en Sevilla el 03 de Octubre de 2023.

Sr. D. Francisco Anaya Benítez

Prestigio de las editoriales según expertos españoles. Clasificación general 2022

Editoriales españolas

Posición	Editorial	ICEE
1	Tirant lo Blanch (Grupo editorial Tirant lo Blanch)	1096
2	Aranzadi (Aranzadi LA LEY / Karnov Group)	760
3	Dykinson	758
4	McGraw Hill	541
5	Alianza (Grupo Anaya, Hachette Livre)	530
5	Pirámide (Grupo Anaya, Hachette Livre)	530
6	Cátedra (Grupo Anaya, Hachette Livre)	525
6	Comares	525
7	Marcial Pons	521
8	Síntesis	487
9	Akal (Grupo Akal)	442
10	Consejo Superior de Investigaciones Científicas (CSIC)	411
11	Tecnos (Grupo Anaya, Hachette Livre)	390
12	Ariel (Grupo Planeta)	379
13	Civitas (Aranzadi LA LEY / Karnov Group)	274
14	Pearson Educación	204
15	ESIC Editorial	192
16	Iberoamericana Vervuert	182
17	La Ley (Aranzadi LA LEY / Karnov Group)	174
18	Elsevier España	167
19	Editorial Universidad de Granada	165
19	Octaedro	165
20	Gredos (Grupo RBA)	164
20	Publicacions de la Universitat de València – PUV	164
21	Crítica (Grupo Planeta)	163
22	Prentice Hall Iberia	156
23	Arco Libros – La Muralla	142
24	Atelier	138
25	Paidós (Grupo Planeta)	137
26	Iustel	132
27	Graó Editorial	126
28	Siglo XXI de España Editores (Grupo Akal)	124
29	Trea	123
30	Gedisa	122
31	Sílex Ediciones	115
32	Los Libros de la Catarata	112
33	Centro de Investigaciones Sociológicas (CIS)	106
33	Ediciones Universidad de Salamanca	106
34	Editorial UOC	104
35	Trotta	101
36	Editorial Universidad de Sevilla	96
37	Ediciones Complutense	93
38	Bellaterra Edicions	89
39	Instituto de Estudios Fiscales (IEF)	86
40	Visor Libros	83
41	Ediciones Paraninfo	80
42	Abada Editores	78
43	Morata	77
44	Bosch (Aranzadi LA LEY / Karnov Group)	76
45	Narcea	74
46	Anthropos Editorial	72
47	Icaria Editorial	70
48	EUNSA. Ediciones Universidad de Navarra	68
48	Laborum Ediciones	68

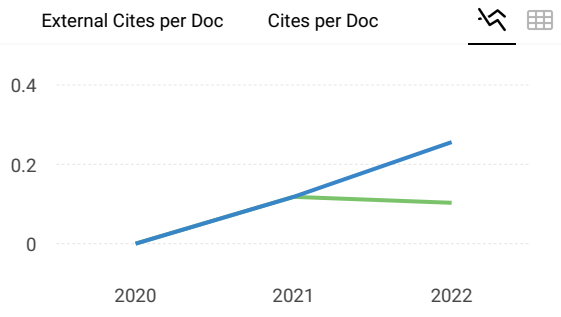
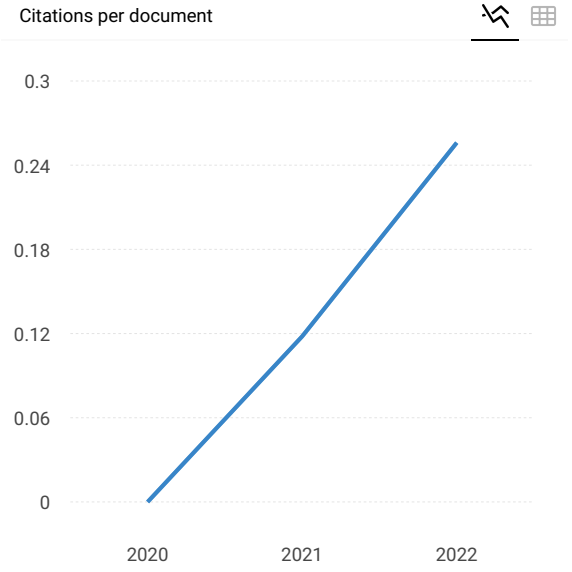
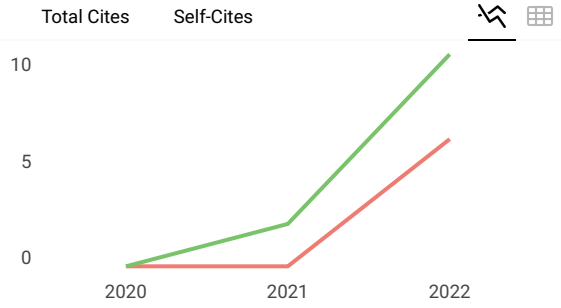
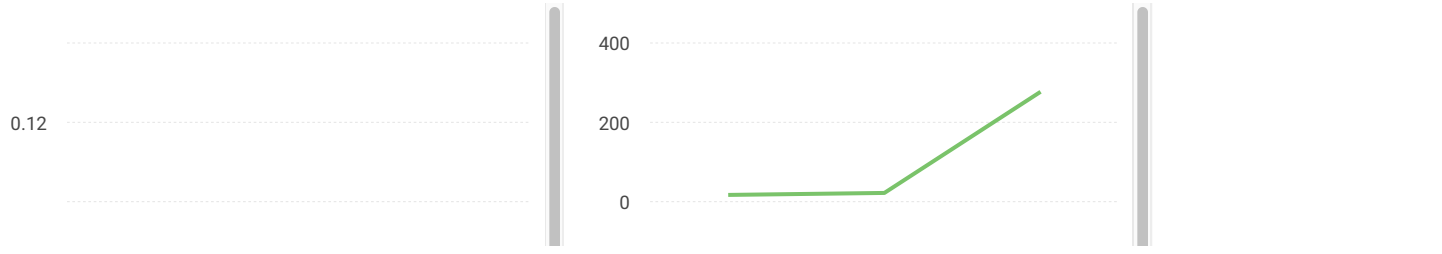
Editoriales extranjeras

ICEE	General	Posición	Editorial	ICEE
1243	1		Oxford University Press	1243
1126	2		Routledge (Taylor & Francis Group)	1126
1099	3		Cambridge University Press	1099
950	4		Springer	950
497	5		Elsevier	497
416	6		McGraw Hill	416
416	6		Wiley-Blackwell	416
350	7		Peter Lang Publishing Group	350
324	8		Brill	324
313	9		Thomson Reuters	313
305	10		Palgrave Macmillan	305
305	10		Sage Publications	305
255	11		Taylor & Francis (Taylor & Francis Group)	255
239	12		Brepols Publishers	239
235	13		De Gruyter	235
230	14		Harvard University Press	230
200	15		Emerald	200
183	16		Giuffrè	183
168	17		Prentice Hall	168
141	18		John Benjamins Publishing Company	141
132	19		MIT Press	132
128	20		Universidad Nacional Autónoma de México (UNAM)	128
119	21		Fondo de Cultura Económica (México)	119
118	22		Iberoamericana Vervuert	118
109	23		Chicago University Press	109
102	24		Pearson Publishing	102
98	25		Presses Universitaires de France (PUF)	98
93	26		Wolters Kluwer International	93
90	27		IGI Global	90
89	28		Dalloz	89
81	29		Edward Elgar Publishing	81
80	30		Kluwer Academic Publishers (Wolters Kluwer)	80
74	31		L'Harmattan	74
72	32		Academic Press (Elsevier)	72
67	33		C. H. Beck	67
65	34		Princeton University Press	65
62	35		California University Press	62
60	36		Yale University Press	60
59	37		Gallimard	59
57	38		Reichenberger	57
55	39		Bloomsbury	55
53	40		Cedam (Wolters Kluwer)	53
48	41		Porrúa	48
46	42		Clarendon Press (Oxford University Press)	46
39	43		Nova Science Publishers	39
38	44		Columbia University Press	38
	44		HumanKinetics	
	45		Giapicchelli	
33	46		Il Mulino	33
31	47		Electa (Mondadori)	31
30	48		Colegio de México	30
30	48		Edinburgh University Press	30
30	48		Stanford University Press	30
30	48		Viella	30

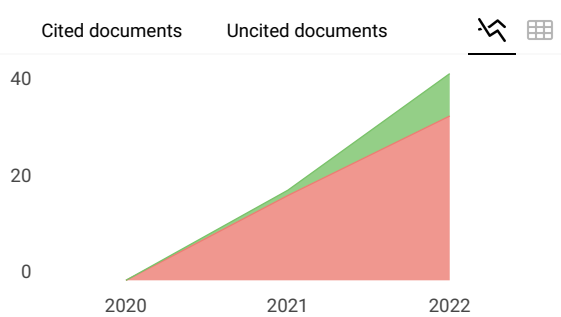
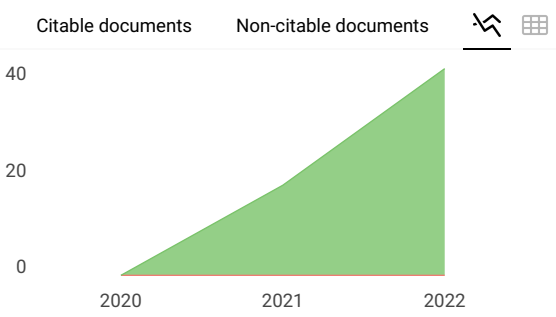
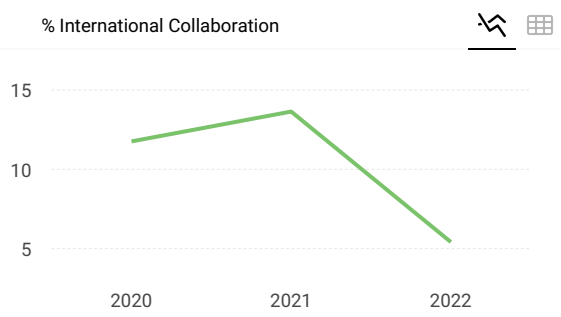
Publication 3: “Female Leadership Portraits in Commercial Movies: Gender Social Representations from the STEAM Sector”.

TECHNICAL DATA	
Authors: Tatiana Buelvas-Baldiris ¹ , Rainer Rubira-García ²	
Title: “Female Leadership Portraits in Commercial Movies: Gender Social Representations from the STEAM Sector”	
Journal: International Visual Culture Review/ Revista Internacional de Cultura Visual	
Volumen: 15 Number: 4	
Editorial: GKA Ediciones	
Country: Spain	
Year: 2023	
Pages: pp. 2-15	
DOI: 2695-9631 - /10.37467/revvisual.v15.4960	
Link: https://journals.eagora.org/revVISUAL/article/view/4960	
Quality criteria: Scopus, SJR. SCImago Journal & Country Rank, Academic Search Premier, Fuente Academica Plus, DIALNET, REDIB. Red Iberoamericana de Innovación y conocimiento científico.	
Quality Index from Journal: 0.1 Cite Score, 14th Percentile Scopus, Q2. Scimagojr, SJR 2022 0.117,	

Authors contributions	
Concept and design:	Tatiana Buelvas-Baldiris and Rainer Rubira-García
Methods:	Tatiana Buelvas-Baldiris and Rainer Rubira-García
Discussion and conclusions:	Tatiana Buelvas-Baldiris and Rainer Rubira-García
Writing, format, last draft revision and approval:	Tatiana Buelvas-Baldiris and Rainer Rubira-García



- Cites / Doc. (4 years)
- Cites / Doc. (3 years)
- Cites / Doc. (2 years)



VISUAL Review.
International Visual Culture...

Q2 Visual Arts and Performing Arts
best quartile

SJR 2022
0.12

powered by scimagojr.com

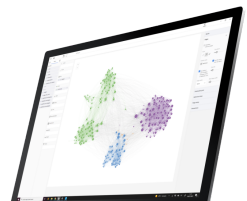
← Show this widget in your own website

Just copy the code below and paste within your html code:

`<a href="https://www.scima`



Explore, visually communicate and make sense of data with our



Publication 4: “Social Representations on Lithuanian Women Leaders in the STEAM Fields: A Critical Discourse Analysis”.

TECHNICAL DATA	
Authors: Tatiana Buelvas-Baldiris, Rainer Rubira-García, Rasa Pocevičienė.	
Title: “Social Representations on Lithuanian Women Leaders in the STEAM Fields: A Critical Discourse Analysis”	
Journal: Information & Media - Informacijos Mokslai	
Volumen: 97 Number: N/a	
Editorial: N/A	
Country: Lithuania	
Year: 2023	
Pages: 69-83	
ISBN or DOI: ISBN 2783-6207/ DOI: 10.15388/Im.2023.97.60	
Link: https://www.journals.vu.lt/IM/article/view/27648	
Quality criteria: Scopus, SJR. SCImago Journal & Country Rank, BASE, Cabell’s directories of Academic Journals, CEEOL, CORE, Dimensions, DOAJ Seal, EBSCO, ERIH-PLUS, Google Scholar (h-index 7; g-index 9), HEAL link (Hellenic Academic Libraries Link), JUFO portal, Journal Scholar Metrics, JournalTOCs, Norwegian Register for Scientific Journals, Lituaništika, ROAD, Redalyc, ScienceGate, ScienceOpen, Scilit, Ulrich’s Periodicals Directory.	
Quality Index from Journal 0.5 Cite Score, 28th percentile Scopus, Q3 Scimagojr, SJR 2022 0.150.	



Authors contributions	
Concept and design:	Tatiana Buelvas-Baldiris ¹ , Rainer Rubira-García ²
Methods:	Tatiana Buelvas-Baldiris ¹ , Rainer Rubira-García ^{2*}
Discussion and conclusions:	Tatiana Buelvas-Baldiris ¹ , Rainer Rubira-García ^{2*} , Rasa Pocevičienė ³ .
Writing, format, last draft revision and approval:	Tatiana Buelvas-Baldiris ¹ , Rainer Rubira-García ^{2*} , Rasa Pocevičienė ³ .




Scimago Journ: Enter Journal Title, ISSN or Publisher Name


- Home
- Journal Rankings
- Country Rankings
- Viz Tools
- Help
- About Us

Information and Media

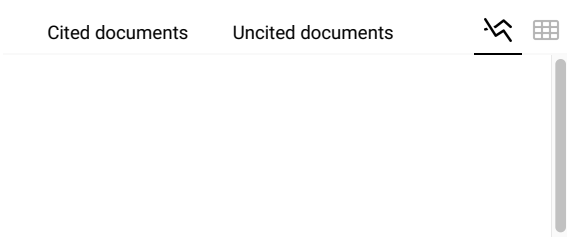
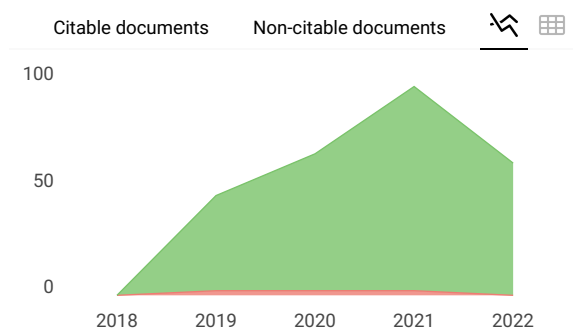
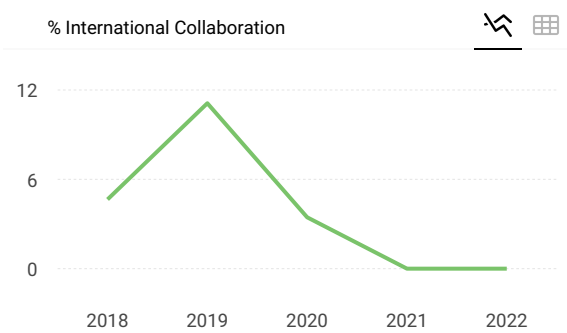
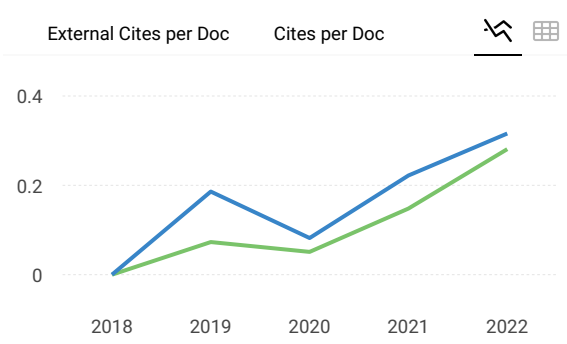
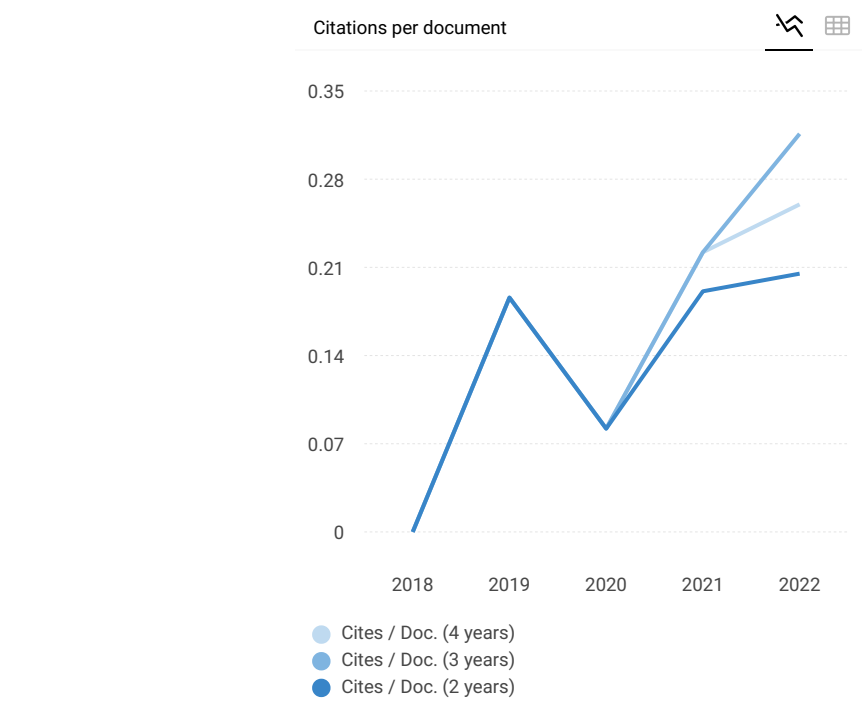
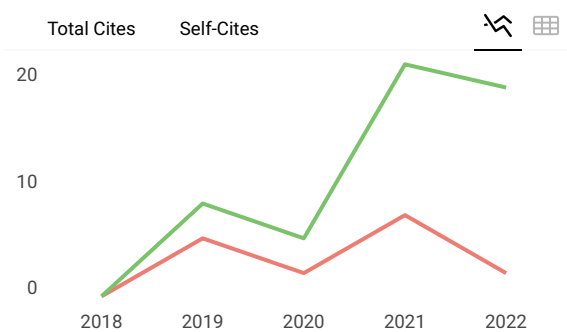
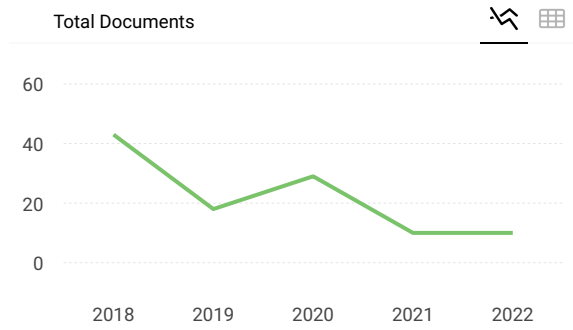
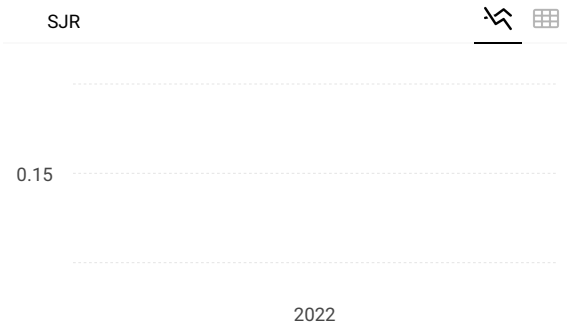
COUNTRY	SUBJECT AREA AND CATEGORY	PUBLISHER	H-INDEX
<p>Lithuania</p>  <p>Universities and research institutions in Lithuania</p>  <p>Media Ranking in Lithuania</p>	<p>Business, Management and Accounting Management of Technology and Innovation</p> <p>Decision Sciences Information Systems and Management</p> <p>Engineering Media Technology</p> <p>Physics and Astronomy Physics and Astronomy (miscellaneous)</p> <p>Social Sciences Political Science and International Relations Sociology and Political Science</p>	Vilnius University Press	3

PUBLICATION TYPE	ISSN	COVERAGE
Journals	27836207	2022

 Join the conversation about this journal

 Quartiles





Show this widget in your own website

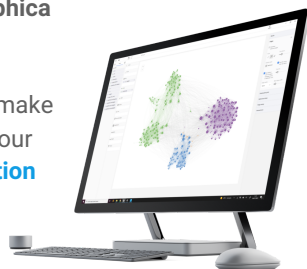
Just copy the code below and paste within your html code:

```
<a href="https://www.scimaç
```




SCImago Graphica

Explore, visually communicate and make sense of data with our **new data visualization tool.**



Metrics based on Scopus® data as of April 2023

Leave a comment

Name

Email

(will not be published)

I'm not a robot

reCAPTCHA
[Privacy](#) - [Terms](#)

Submit

The users of Scimago Journal & Country Rank have the possibility to dialogue through comments linked to a specific journal. The purpose is to have a forum in which general doubts about the processes of publication in the journal, experiences and other issues derived from the publication of papers are resolved. For topics on particular articles, maintain the dialogue through the usual channels with your editor.

