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A New Approach To Encourage The Next Generation Of Female Engineers In Spain: A Young And Fresh Podcast To Attract More Girls To The Field: “Clau, Quiero Ser Ingeniera”

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**A NEW APPROACH TO ENCOURAGE THE FUTURE
GENERATION OF FEMALE ENGINEERS IN SPAIN: AN
INNOVATIVE AND ENGAGING PODCAST: “CLAU, I WANT TO BE
AN ENGINEER”
(PRACTICE PAPER)**

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ABSTRACT

The underrepresentation of women in STEM fields is a complex issue with multiple factors that remain unclear. At Universidad Politécnica de Madrid (UPM), we have dedicated years to devising strategies aimed at attracting more girls to this domain. As the coordinating institution of the EELISA alliance, where we endeavor to define the European engineer, we confront gender inequality as one of the foremost challenges. To address this need, a 4th year student at UPM conceived an initiative: a podcast with three primary objectives. Firstly, it aims to highlight the accomplishments of female engineers who can serve as role models for girls. Secondly, it seeks to spark the interest of girls in pursuing STEM careers. Lastly, it aims to increase the visibility of current female engineering students. The student discusses engineering in a captivating manner, revealing the fascinating world of STEM. This informal conversation between two women resonates with girls, allowing them to envision themselves undertaking similar paths in the future. The content is readily accessible through popular social networks and platforms such as Instagram, TikTok, YouTube, and Spotify, which are frequented by young people daily. This ongoing project has the potential to significantly contribute to the rise in the number of girls applying to study engineering in Spain.

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1. INTRODUCTION

In the last 100 years women have made important improvements in education and the workplace. There are currently more women than men studying at university in Spain. According to the data presented by the Ministry of Universities (Ministerio de Universidades 2022), in university entrance exams, women represent a higher percentage than men (57,3% in 2020). The percentage of women enrolled in Bachelor's (56.3%) and Master's (54.8%) in the 2021-22 academic year is also higher than that of men. In PhD the percentages of men and women are very similar.

In scientific and technological areas, however, women's educational achievements have been less impressive and their progress in the workplace perhaps slower. The distribution by areas of education is not homogeneous. The participation of women is unsatisfactory in STEM² areas. More specifically, at the undergraduate level, men outnumber women in nearly all fields of Physics, Engineering and Computer Science, known as PECS, where the gender imbalances find a dramatic difference.

This underrepresentation of women in engineering studies and careers is a complex issue that has been increasingly studied in literature in the last decade. Various factors have proven to be the cause of this imbalance: gender stereotypes and socialisation, lack of female role models, educational and cultural factors, work environment and bias or lack of awareness and exposure.

2. UPM GENDER DATA

Table 1: Percentage of female students UPM, year 2021-22 by education level

	Male	Female	Total	Female (%)
Bachelor's Degree	19.893	9.649	29.542	32,66%
Master's Degree	4.170	2.323	6.493	35,78%
Doctorate (PhD)	1.442	715	2.157	33,15%
TOTAL	25.505	12.687	38.192	33,22%

Source: (Universidad Politécnica de Madrid 2022)

3. WHAT DOES UPM DO TO ATTRACT FEMALE STUDENTS?

It is crucial to emphasize that the promotion of gender equality and diversity is a continual undertaking that necessitates sustained, long-term endeavors from both the university and society at large.

At the Universidad Politécnica de Madrid (UPM), we employ a range of strategies aimed at fostering the engagement of female students within our engineering schools. These initiatives can be broadly classified into the following four categories:

1. Orientation and dissemination programs: The UPM organise events, talks and guided tours specifically aimed at secondary and high school students. These programs aim to show them the opportunities and potential of

² STEM: Science, Technology, Engineering and Mathematics.

engineering careers, as well as demystify gender stereotypes associated with these areas.

2. Mentoring and tutorials: The university establishes mentoring and tutorial programs where students have the support of female professionals and advanced students in engineering. These women act as role models and provide academic and career guidance, which can help boost girls' confidence and motivation.
3. Participation in external networks and events: UPM participates in conferences, fairs and other events related to the promotion of gender equality and the participation of women in STEM careers. This allows establishing alliances and collaborations with other institutions and organisations that share similar objectives.
4. Awareness and training: The university promotes awareness and training in gender equality among its academic community. This includes training for faculty and staff to eliminate potential gender biases in education and promote an inclusive and equitable environment.

Beyond -and in parallel with- these initiatives, we were looking for a new way to reach those girls born between 2007 and 2013, who are mostly part of what is called Generation Z.

4. WHAT KIND OF PLATFORMS DO OUR TARGET USE?

4.1 The importance of podcasts. Spotify and YouTube.

Generation Z, also known as Gen Z, is fundamentally altering the established conventions pertaining to the consumption and comprehension of information, specifically in terms of how, when, and where it is accessed. This cohort invests considerable amounts of time in engaging with highly personalized social media platforms, which have become their primary outlet for accessing news, information, establishing social connections, engaging in online shopping, and various other activities. A research study indicates that when seeking information regarding restaurants, bookshops, or bakeries, for instance, Gen Z individuals predominantly turn to TikTok rather than relying on search engines or online maps. TikTok has emerged as their preferred platform of choice, serving as the default option for their needs (Oliver Wyman Forum 2023).

Podcasts have emerged as a platform through which members of Generation Z can navigate life's most intricate challenges. Whether they are grappling with significant transitions such as commencing college or entering the realm of employment, or seeking insights on relationships, Spotify stands out as a primary tool facilitating the discovery of such answers through podcasts.

As adolescents develop a broader understanding of life and cultivate their own perspectives, they increasingly find themselves confronted with the task of managing profound emotions. In this context, audio content, particularly podcasts, plays a crucial role in providing essential support. In Spain, over the past year, there has been a remarkable surge in the number of young individuals tuning in to podcasts on Spotify,

with an astounding 127% increase during the first quarter of 2022 compared to the preceding year. Presently, more than half (54%) of young people aged between 18 and 24 in Spain listen to podcasts at least once a week, and this figure stands at 32% for those aged between 15 and 17.

According to Generation Z, one of the key attractions of audio content lies in the fact that podcasts provide a secure environment for processing their emotions. Whether they struggle with expressing their thoughts due to shyness or are still searching for the appropriate words to articulate their feelings, podcasts offer a non-judgmental space. In Spain, a notable 64% of young individuals aged 18 to 24 acknowledge turning to podcasts to find answers to personal or challenging questions before confiding in their families. Furthermore, 68% of them reveal that they listen to podcasts as an information source to enhance their conversations with friends. This does not imply that Generation Z avoids deep personal discussions face-to-face, but rather that podcasts have become a valuable complement to their existing communication channels.

This approach aligns perfectly with the underlying purpose of the podcast "Clau, I want to be an engineer," as it resonates with the intended narrative model.

4.2 Social Media: Instagram and TikTok

Our podcast also utilizes social media with a dual objective:

1. To showcase episode highlights: Users may not have the opportunity to listen to the entire podcast, but they can access bite-sized messages encapsulating the key themes we aim to convey. These messages touch upon topics such as resilience, effort, dreams, friendship, curiosity, and enthusiasm.
2. As a means of communication and content promotion: Social media serves as a platform for effectively communicating and disseminating the podcast's contents.

Among Generation Z in Spain, Instagram stands as the most extensively utilized social network. We are currently in the process of familiarizing ourselves with Instagram Reels, wherein interactions are contingent upon the emotional connection with the reel, its dissemination across other platforms, and comprehending an algorithm that undergoes frequent modifications.

In Spain, TikTok garners usage from 28% of the entire population, with the predominant age group being 16 to 24 years old. Within this age range, an impressive 62% of users engage with the platform (Data Reportal 2023). Additionally, the report highlights that TikTok users in Spain devote an average of 52 minutes per day to the application, signifying a substantial level of engagement from Generation Z.

Furthermore, it is worth noting that TikTok is set to introduce a significant change that holds relevance for our podcast. This change involves the implementation of a label or tag specifically designated for videos and programs associated with scientific and technical knowledge—a STEM tag. This feature is already operational in the United States and is anticipated to have a significant impact.

5. HOW THE PODCAST “CLAU, I WANT TO BE AN ENGINEER” IS BUILT

5.1 Justification

Our primary aim is to captivate the interest of young individuals through storytelling. The program's design adheres to the structure commonly referred to as "the Path of the Hero," which draws inspiration from Joseph Campbell's *Monomyth* (Campbell 2008). Specifically, our focus lies in the journey of embarking on a university education, particularly within the STEM field, encompassing its fundamental principles (Mestas and Close 2019). This structure forms the foundation of our storytelling approach.

The program aims to offer more than just a catalogue of STEM careers at our university; it strives to provide a collection of stories featuring young individuals on their personal heroine's journey, specifically highlighting their experiences within various schools of engineering or architecture. Listeners, particularly young female students, establish a connection between the narratives they hear and their own life paths. They find resonance in shared perspectives while discussing their studies, fears, influences, and most importantly, their conclusions and lessons learned. This journey has led them to a point where they embody the spirit of STEM careers, embracing the motto "learning by making mistakes."

Listeners readily identify or envision themselves within the different situations described in the podcast. They recognize a comprehensive vision of life and the future that is fully developed. The program becomes a personal and intimate story.

The genesis of this program can be traced back to the academic experience of a student from Universidad Politécnica de Madrid, who, after participating in an Erasmus program at Politecnico di Milano (Italy), realized that the existing gender gap was prevalent in both institutions. This realization prompted her to take action, acknowledging that if those of us who are involved and committed do not step forward, who else will?

Upon analyzing various initiatives, it became evident that there was a lack of role models who could provide insights into the academic transition and the overall life experience within STEM fields. The student herself yearned for a program that would elucidate what a STEM career truly entails, how it is experienced throughout the years of study, and how professionals in these fields are perceived. She expressed, "I have not come across a program that informs me about the essence of this degree. If I had known, my fears and uncertainties would have dissipated. How can I ensure that other young individuals are aware of this in advance?"

The transition from school to university typically gives rise to a significant influx of doubts, stress, failures, the need for organization, and the formation of study groups, among other challenges. This journey often leaves students feeling overwhelmed. These considerations have led to the development of a program that aims to provide answers to the very same questions that students like this individual once coped with.

5.2 Podcast structure and duration

Each chapter of the program has a duration ranging from 40 to 60 minutes and encompasses the following structure and topics:

1. The motivations that drive female students to pursue a STEM degree.
2. The influential figures and role models they look up to, including parents, friends, high school teachers, and individuals from whom they sought advice while contemplating this degree.
3. The means through which they discovered the specific degree they pursued.
4. Their initial experiences and challenges during the early years of university.
5. Their preferred modules, seminars, or courses that amplify their motivation.
6. Lessons learned from failures and how they navigate and cope with setbacks.
7. The connections they form with faculty members and classmates.
8. Their aspirations and future projections.
9. Insights they would share with their 15-year-old selves.
10. The mistakes they have made and the valuable lessons they have derived from them.
11. Additional knowledge and skills they acquire beyond the technical aspects of their university education.
12. Their strategies for encouraging young girls to embark on STEM careers.

Each chapter delves into these aspects, providing a comprehensive exploration of the personal journeys and experiences of these young female students pursuing STEM degrees.

5.3 Project description

We have considered two distinct groups of individuals based on their stage of life, primarily because their expectations differ significantly:

1. Young female students at the secondary level (secondary level, baccalaureate) who are yet to enter university. This group seeks to understand the profiles of current university students and aspire to envision themselves in the shoes of those who are nearing the completion of their degrees.
2. Female students pursuing engineering degrees. This group yearns to connect with peers who are undergoing similar experiences and to gain reassurance that the culmination of their academic endeavors will lead to fruitful professional trajectories, akin to the accomplishments achieved by numerous researchers and executives.

With these objectives in mind, we have meticulously devised the following schedule:

Phase 1 – December 2022 – September 2023:

- Conduct interviews with young female students or recent graduates.
- Conduct interviews with female lecturers or professors who serve as role models for our students.

Phase 2 – September 2023 - 2024:

- Conduct interviews with female students.
- Conduct interviews with female lecturers and professors.
- Present research projects.
- Conduct interviews with female scientists and researchers.
- Conduct interviews with female executive directors employed by prominent companies.

Teachers, professors, and other role models play a vital role in instilling a sense of security in current and prospective students. They embody the archetypal "magical character" within the monomyth narrative, serving as guides who equip students with the necessary tools to accomplish their goals. By portraying these role models as ordinary individuals, students perceive them as relatable companions in their educational journey, fostering a closer partnership in the learning process.

6. RESULTS

While it is premature to discuss concrete outcomes, we are pleased to note that the feedback we have received thus far has surpassed our expectations. Our audience has been sending us numerous uplifting messages, indicating that we are making a positive impact on individuals who are navigating critical decisions regarding their professional careers.

Regarding the growth of our presence on social media, it is important to clarify that we have made no investment in advertising. As mentioned, the podcast is divulged through platforms such as Spotify, YouTube, Instagram, and TikTok. A summary of its performance can be observed in Tables 2, 3 and 4.

Table 2: Podcast data from different platforms May 2023

	Spotify	YouTube	Instagram	TikTok
Followers	394	174	753	1.767
Total impressions	3.086	4.377	227.813	544.694
Streams last 30 days	1.499	1.785	50.361	337.894
Streams last 7 days	497	641	8.797	88.846

Table 3: Total followers from February to 10th May 2023

	Spotify	YouTube	Instagram	TikTok
February	129	15	210	0
March	169	42	339	657
April	339	120	509	1.568
May 10 th	394	174	753	1.760

Table 4: Accumulated impressions (reach) from February to 10th May 2023

	Spotify	YouTube	Instagram	TikTok
February	987	425	54.686	0
March	1.449	1.624	142.991	69.010
April	2.433	3.400	183.624	445.760
May 10 th	3.086	4.377	227.813	544.694

The data indicates a consistent increase in followers and reach across all platforms. There has been a progressive rise in the number of both followers and number of reproductions each month, signifying a growth in popularity or reach on these platforms. TikTok exhibits the highest follower growth compared to other platforms. This suggests that TikTok has proven particularly effective in attracting and engaging with its audience. In summary, the presence on these platforms has successfully attracted and expanded a follower base, with TikTok demonstrating the most notable growth.

7. CONCLUSIONS

EELISA is an alliance of European universities in the field of engineering, technology, and innovation that aims to strengthen and enhance engineering education, research, and innovation throughout Europe. Through collaboration, member universities can combine their resources and expertise to tackle shared challenges and promote excellence in engineering education. One of EELISA's objectives is to develop a unified European engineer profile deeply rooted in society, characterized by enhanced inclusivity, interdisciplinary collaboration, and unwavering dedication.

Promoting inclusivity and addressing the gender gap in engineering is not only a matter of fairness but also crucial for advancing the field. Diversity brings varied perspectives, experiences, and approaches, fostering innovation, creativity, and improved problem-solving. Challenging gender stereotypes and promoting positive portrayals of women in engineering is essential for attracting more women to the field. Showcasing successful women engineers, highlighting their contributions, and dispelling misconceptions about gender and engineering abilities can help reshape perceptions.

Our ongoing efforts to promote inclusivity and bridge the gender gap in engineering involve actively working towards creating a more equitable and diverse engineering community. The podcast "Clau, I want to be an engineer" is one of the most effective tools we have discovered to reach young audiences and it has the potential to significantly contribute to the rise in the number of girls applying to study engineering in Spain.

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