UNESCO *Gender and STEM Education in Romania Project*

UNESCO Program: *Revitalizing STEM Education to Equip Future Generations with STEM Competency in South-East Europe and the Mediterranean*, supported by Huawei Technologies

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GENSTEMED Conclusions and Way Forward Report

I. Introduction

The present ***GENSTEMED Conclusions and Way Forward Report*** is delivered by the Digital Leadership In fulfillment of the terms of the ***Gender and STEM Education in Romania*** ("GENSTEMED") project, with ***Intellectual Output reference IO109e***, and as Annex to the ***GENSTEMED Final Report, reference IO109***.

II. Project Activities

A summary of activities, milestones and deliverables achieved in the "Gender and STEM Education in Romania" project is included below.

A. Research Activities:

1. Desk Research: Led by expert Cheryl Miller and project partner **Digital Leadership Institute** ("DLI" - dlii.org), the GENSTEMED project carried out *desk research* to understand the landscape of Gender and STEM Education in Romania, including reference to the UNESCO "Gender and Digital Policies in SEE" report and its sources, and the 2023 STEM Alliance report, and utilizing the UNESCO SEE STEM Alliance reference library;

2. Survey: DLI devised a research methodology based upon which DLI and AFIST carried out qualitative research on the Gender and STEM Education ecosystem in Romania by developing and delivering a series of **online surveys** (x4) in the English and Romanian languages to which 100+ Romanian STEM educators, practitioners, ecosystem actors, and students responded;

3. Interview: Led by project partner **Asociația Femeilor în Inginerie, Știință și Tehnologie** ("AFIST" - https://afist.ro/) and building on survey outcomes, DLI and AFIST developed and delivered a series of **interview questionnaires** (x2), and AFIST carried out fifty (50) interviews of Gender and STEM Education ecosystem actors in order to gain an in depth and diverse overview of actions and practices that promote gender equity in STEM in Romania;

4. Showcase: Led by project partner **Hermann Oberth International German School** ("Scoala Germana" - https://www.scoala-germana.ro/), a showcase event on "Gender and STEM Education in Romania" was carried out on 6 February 2025 in order to engage ecosystem actors and share Interim Research Findings in the context of a Practitioner Panel/Roundtable, Keynote Speeches and Inspiring Talks attended by over one hundred target stakeholders and beneficiaries.

E. Report: Led by DLI and supported by AFIST and Scoala Germana, based on results from the Surveys and Interviews, Research outcomes from the GENSTEMED project were captured in the project's ***Intermediary Report*** and in the ***Final Project Report.***

B. Educational Activities:

1. Curricula: Led by DLI and SG, the GENSTEMED project develop and delivered fifteen hands-on, STEM and digital skills workshops on emerging-technology subjects for K-12 students, which showcased practices for increasing participation of girls and women in STEM Education and Careers, taking advantage of critical thinking and problem solving approaches, inquiry-based learning, and promoting cross-sectoral skills and citizen science;

2. Train-the-Trainer Toolkit: Led by DLI, one train-the-trainer toolkit for the emerging technology workshops/curricula was developed and disseminated toward stakeholders in the K-12 school system of Romania, SEE, including STEM Alliance, EU, and beyond;

3. Showcase: Led by Scoala Germana, and supported by DLI and AFIST, a showcase event with in-person stakeholders and remote collaborators, which included organizing the noted Emerging Technology Workshop Curricula for K-12 Students, Keynote Speeches, a Practitioner Panel, and Inspiring Talks targeting K-12 students, was organized in order to share project learnings and showcase best practices for Gender and STEM Education towards project stakeholders and beneficiaries;

4. Report: Led by DLI and supported by AFIST and Scoala Germana, an ***Intermediary Report*** and the ***Final Project Report*** were delivered which include synthesized learnings, outcomes and feedback, as well as Workshop Curricula, the Train-the-Trainer Toolkit, Survey and Evaluation feedback, Analysis and Recommendations, etc., in the form of the project's ***Final Report*** and related ***Annexes***.

III. Conclusions

Based on the Research Activities carried out in the project, a series of Findings and Recommendations were developed and outlined in the GENSTEMED Intermediary Report (reference OOO) and Interview Results Report (reference OOO).

A. Survey Findings

Based on the types of questions posed in the Surveys, and linking these to Research Activity categories, some preliminary findings from the Online Surveys are highlighted in this section.

a) Key Themes - In the two main Research Activity categories, the following key themes emerged from survey responses.

- Girls in STEM:

- *Beliefs and Self-Perception* - The survey responses emphasize the importance of a girl's own beliefs in influencing STEM participation. Specifically:
  - *Belief that STEM careers are exciting*: Scored highest with a weighted average of 3.04/4.
  - *Belief that girls can do valuable things with STEM*: Scored 2.88/4, suggesting that while many recognize the value of STEM, confidence gaps may remain.
- *Family Support* - Family support emerged as a key factor, with parents/guardians' encouragement rated the highest (3.26/4). Mothers working in STEM were perceived as influential (3.04/4), slightly higher than fathers working in STEM (2.94/4).
- *Community Support and Role Models* - Community support, particularly through *school STEM programs* and *teachers*, scored 3.2/4. Role models—both in media and personal networks—had a weighted average of around 3.1/4, indicating their significant role in shaping aspirations.
- *Public and Private Programs* - Programs specifically designed for girls, such as STEM education initiatives, received high scores (3.32/4), indicating their perceived importance. However, private initiatives like corporate-sponsored programs scored slightly lower (3.16/4), reflecting a need for increased visibility and accessibility.
- *Cultural Cues* - Cultural attitudes, such as the belief that "STEM is for girls," scored 3.1/4. However, frequent and positive media portrayals of girls in STEM were rated slightly higher (3.22/4), underscoring the need for societal narratives that normalize girls' participation in STEM.

- Women in STEM:

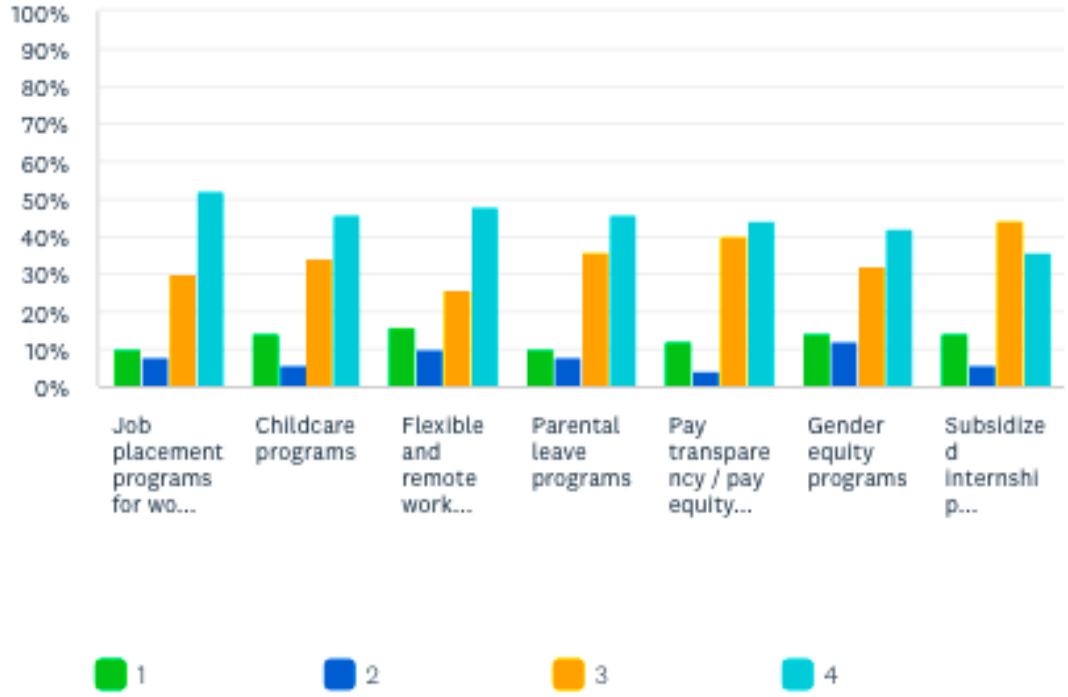
- *Career Beliefs and Motivation* - Key motivators for women in STEM careers include *rewarding career paths* (3.14/4) and *financial incentives* (3.16/4). However, confidence—reflected in "belief that women are good at STEM"—scored 3.12/4, highlighting persistent gaps in self-perception.
- *Family Influence* - Support from spouses and other family members was deemed vital (both scoring 3.06/4). Interestingly, having a relative in STEM scored lower (2.92/4), suggesting that direct familial mentorship may not be as influential as general family encouragement.
- *Community and Mentorship* - Mentorship programs were rated 3.04/4, signaling their role in career development. Similarly, support from colleagues and peer groups scored 3.08/4, reflecting the importance of workplace culture in retaining women in STEM fields.
- *Public and Private Sector Support* - Programs addressing workplace flexibility (3.2/4) and childcare initiatives (3.31/4) were highlighted as critical enablers. Pay transparency and equity initiatives also scored highly (3.16/4), signaling the need for systemic interventions to promote fairness.
- *Leadership and Entrepreneurship* - Despite progress, women in leadership roles face challenges. Gender equity in leadership programs scored 3.2/4, while entrepreneurship initiatives, such as funding for women entrepreneurs in STEM, scored slightly lower (3.08/4).

b) Takeaways - Pending additional responses forthcoming in the project, some initial findings that can be drawn from the Surveys related to the two Key Themes above so far include the following:

- Girls and women face unique but interconnected barriers along the STEM pipeline: Early interventions targeting beliefs, role models, and parental support are critical for girls, while mentorship, flexible work policies, and leadership programs are essential for women;

- The importance of cultural narratives cannot be overstated: Both groups of girls and women benefit significantly from positive media portrayals and visible success stories; and

- Systemic support through targeted programs is key: Public and private initiatives addressing educational access, workplace equity, and entrepreneurial opportunities must be scaled up to close gender gaps in STEM.



"How Important are Public Programs for Women in STEM?" Survey Question

c) Circles of Influence Framework - In turn, the research findings can be viewed through the Circles of Influence Framework as outlined below.

- Girls in STEM:

- *Self* - Survey data reveals that girls' confidence in STEM subjects is a critical factor in their early engagement. Beliefs about their abilities and the relevance of STEM to their future scored moderately, with noticeable gaps in subjects like mathematics and physical sciences. This aligns with early points in the Leaky Pipeline, where perceptions of STEM competence begin to diverge by gender.
- *Family* - Family support emerged as a significant influence. Girls with parents or relatives in STEM were more likely to express interest and confidence in pursuing STEM fields. However, the data also indicates disparities in the type of support—emotional encouragement was more frequent than material or practical support (e.g., funding for extracurricular STEM programs).
- *Community* - Schools and local programs play a vital role in sustaining girls' interest in STEM. Teachers' encouragement and extracurricular activities, such as science fairs and robotics clubs, were highlighted as key enablers. However, rural respondents reported fewer opportunities for STEM engagement, reflecting geographic inequities in the pipeline.
- *Power Centers* - Institutional influences, such as curriculum design and school policies, received mixed feedback. Some respondents noted that STEM opportunities in primary and secondary schools are unevenly distributed, with limited resources available in public schools compared to private institutions.
- *Society* - Broader societal narratives about gender roles in STEM showed both positive and negative trends. Media representation of girls in STEM was seen as improving but still insufficient to normalize the idea of girls excelling in technical fields.
- *Cultural Context* - Cultural stereotypes, such as the perception that STEM is "too difficult" for girls, remain persistent barriers. Respondents identified a lack of visible female role models in STEM as a critical gap in shifting cultural norms.

- Women in STEM:

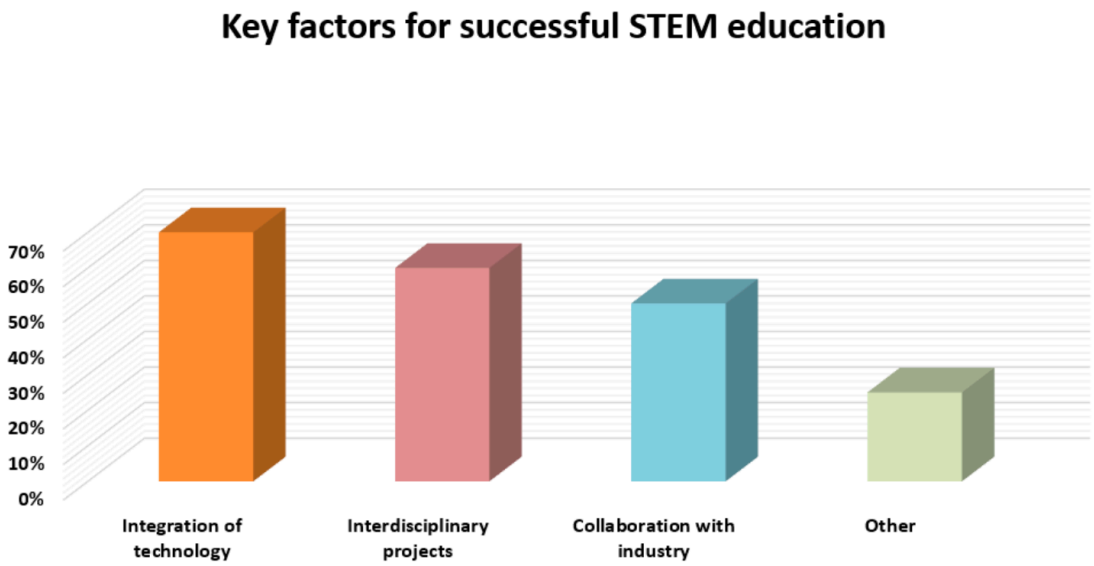
- *Self* - Women's confidence in STEM abilities showed moderate scores, with many highlighting imposter syndrome and societal expectations as challenges. Career motivations were high among women already in STEM, but barriers like unequal pay and limited advancement opportunities tempered enthusiasm.
- *Family* - Spousal and familial support were crucial for women balancing STEM careers with personal responsibilities. Respondents frequently cited challenges related to caregiving roles, particularly in dual-career households. Support from family was more influential than mentorship in some cases, reflecting the continued importance of domestic dynamics.
- *Community* - Workplace culture and mentorship programs received mixed feedback. While mentorship was seen as a valuable resource, respondents noted that male-dominated workplaces often lacked inclusive practices. Peer support networks, however, were highly rated as sources of encouragement and resilience.
- *Power Centers* - Institutional policies such as flexible work arrangements and leadership training programs were identified as critical enablers. However, their availability and accessibility varied widely. Respondents highlighted gaps in equity-focused initiatives, such as childcare support and transparent promotion criteria.
- *Society* - Media portrayals of women in STEM were seen as improving but still skewed toward "exceptional" cases rather than representing diverse, everyday professionals. Societal narratives often reinforced the "double burden" of career and family.
- *Cultural Context* - Deeply rooted gender norms, such as expectations around caregiving and leadership styles, were flagged as persistent obstacles. Women in leadership roles reported facing more scrutiny compared to male counterparts, particularly in technical fields.

d) Leaky Pipeline Insights - Mapped to the "leaky pipeline" phenomenon, the following phenomena can be observed from the research.

- *Girls in STEM* - The primary points of attrition for girls include a decline in confidence during secondary education and unequal access to STEM resources, particularly in rural areas. Early interventions targeting beliefs and systemic inequities are essential.
- *Women in STEM* - The major points of attrition for women occur during transitions from tertiary education to careers and from mid-level positions to leadership roles. Addressing systemic barriers—such as workplace policies, mentorship availability, and cultural norms—is critical to retaining women in STEM.

C. Interview Findings

Following on outcomes gathered from the Online Surveys, a series of Interviews were conducted with fifty respondents. The Interviews were captured consistent with the Methodology elaborated for the project, as translated to the Circles of Influence Framework, and linked to the Leaky Pipeline phenomenon.



a) Interview participant profile - Interview participants were between 20 and 60 years old, with varying levels of experience in STEM fields, ranging from recent students to those with over 25 years of professional experience. The breakdown of participants included 10 students (20%), 15 professors (30%), and 25 STEM professionals (50%) (researchers, engineers, entrepreneurs, and more). This distribution allowed for a broad understanding of the challenges faced at different career stages.

Future studies should further diversify the sample by including participants from rural or underserved regions, where access to STEM education is limited. Including women from socio-economically disadvantaged backgrounds would provide a more holistic understanding of the barriers faced by women in all areas of society.

b) Career Path - Women in STEM often experience a process of self-discovery in terms of their interests and professional identity, which contrasts with traditional expectations of early career specialization. Also, encouraging early career exploration and offering flexible curricula could support students in finding their areas of interest. Educational institutions should create opportunities for interdisciplinary study and provide platforms for exploring various STEM fields through internships, workshops, or joint projects with industry professionals.

c) Role of Mentorship - The absence of mentors, especially female mentors who can relate to the specific challenges faced by women in STEM, was seen as a significant obstacle. Many respondents emphasized that professors, particularly female ones, play a central role in nurturing the growth of STEM careers.

d) Challenges in STEM education - To address challenges to STEM education, increased investment in STEM infrastructure, particularly in rural and underfunded schools, is essential. Schools should be equipped with modern technology, laboratories, and teaching materials. Gender bias in textbooks and curricula should also be rectified, ensuring that female role models are visible. Outreach programs such as STEM camps and competitions targeted at girls should be introduced to increase interest and engagement in STEM from a young age.

e) Key factors for successful STEM education - Educational systems should integrate more technology into the curriculum, incorporating virtual labs, simulations, and industry-standard software. Interdisciplinary projects should be a core part of STEM education, allowing students to engage with complex, real-world problems that require a blend of knowledge from multiple disciplines. Collaboration between academia and industry should be increased through internships, joint research projects, and industry partnerships, ensuring students gain hands-on experience and stay connected to emerging trends in STEM fields.

f. The future of STEM education - Romania should prioritize creating curricula that foster interdisciplinary skills, such as problem-solving and critical thinking, which are increasingly important in modern STEM careers.Investment in technology and digital tools should be accelerated to ensure that students are familiar with the tools used in contemporary STEM fields. Additionally, efforts to improve diversity should focus on creating inclusive environments that attract and retain students from underrepresented groups.

g. Promoting STEM - Governments, schools, and organizations should invest in outreach programs that showcase female STEM role models, encourage girls to participate in STEM competitions, and provide networking opportunities for young women. Additionally, organizing mentorship and professional development events focused on women in STEM could further encourage the next generation of female scientists, engineers, and innovators.

h. Inclusive STEM learning environments - To improve STEM education, it is crucial to focus on financial support, mentorship, and diversity training to ensure that all students, regardless of their background, have the opportunity to succeed. Gender balance policies and mentorship programs for underrepresented groups would create a more inclusive and supportive environment.

i. Key strategies to revitalize STEM education - To revitalize STEM education, fostering closer industry-university partnerships, promoting STEM awareness, and offering incentives can attract more students to the field. Interdisciplinary curricula will also prepare students to solve complex, real-world problems.

j. Collaboration between academia and industry - Creating internship programs, joint research initiatives, and industry-sponsored competitions would help bridge the gap between theoretical knowledge and real-world applications. Furthermore, industry involvement in curriculum development would ensure that educational programs align with the latest technological and market trends.

k. Romania's position in the European context - Romania should increase its investment in STEM education and infrastructure, particularly in rural areas. Supporting innovation through grants, scholarships, and incentives for start-ups can stimulate the growth of STEM industries. Additionally, creating an attractive environment for multinational companies will contribute to job creation and the development of a sustainable STEM ecosystem in Romania.

IV. Way Forward

GENSTEMED Desk and Research Activities, as well as Educational Activities carried out in the project, highlighted critical insights into the challenges and opportunities in promoting gender-equity in STEM education and careers in Romania and beyond. Through surveys carried out across the STEM ecosystem and in-depth interviews with students, professors, and professionals in the field, several best practices and key themes emerged that can guide future efforts to improve STEM education and promote gender equity.

A. Best Practices:

Science, Technology, Engineering, and Mathematics (STEM) have long been at the core of innovation, yet attracting students—particularly girls—to these fields remain a challenge. Through its Educational and Research Activities, the GENSTEMED project explored and showcased practical strategies that successfully spark interest in STEM from an early age and ensure an inclusive and supportive learning environment. Through the project, both experts from education, research and communication shared insights on how they engage students by bringing them into the lab to experience science firsthand, the impact of role models, the importance of a strong support system, including parents and teachers, and the effectiveness of tailored communication in making STEM more accessible.

1. Introducing STEM early

Early exposure to science and technology significantly increases students' likelihood of developing long-term interest. Interactive activities in early education and playful learning experiences captured students' imaginations and helped build confidence and familiarity with science.

2. Bringing students into the lab to see science in action

Hands-on experiences play a crucial role in making STEM subjects more exciting and tangible. Giving students—especially young girls—the opportunity to visit laboratories, participate in experiments, and engage with real-world applications fosters curiosity and confidence in pursuing science-related studies.

3. Seeing the real-world impact of STEM is a powerful motivator

One of the most effective ways to inspire students—especially girls—is to show them how STEM directly impacts the world around them. Whether through environmental sustainability projects, medical breakthroughs, or technological innovations that improve daily life, students became more engaged when they see the tangible effects of scientific work. By emphasizing the societal impact of science and technology, educators and mentors were able to instill a sense of purpose and motivation in young learners.

4. The power of role models

Representation has a profound impact on students' aspirations. Female scientists, engineers, and innovators serve as powerful role models, demonstrating that STEM careers were both attainable and rewarding.

5. Creating a supportive environment

Students flourish when their interest in STEM is encouraged at home and in school. Training teachers to foster inclusive learning environments and equipping parents with the knowledge to support their children's curiosity in science help sustain long-term engagement.

6. Tailored communication is key

Presenting STEM topics in ways that resonates with students' experiences, interests, and ways of learning makes a difference. Avoiding overly technical jargon, using engaging storytelling, and connecting science to real-world challenges made STEM fields more accessible and appealing.

B. Key Themes

1. Mentorship

The project's Research Activities reinforce the **significant role mentorship plays** in shaping the careers of women in STEM, with many respondents identifying the lack of mentorship as a major barrier to their professional development.

2. Policy Action
Such as inadequate infrastructure, gender biases, and a lack of female role models in STEM were noted as persistent challenges that must be addressed to create more inclusive and accessible environments for women. Interestingly, while women in Romania generally held positive perceptions about their abilities in STEM, systemic barriers and societal norms continue to delay their progress. This paradox highlights the need for systemic change—particularly in addressing gender bias in hiring, promotion practices, and cultural expectations that shape the career trajectories of women in STEM.

2. Real-world Alignment
To enhance STEM education, research participants emphasized the importance of modernizing infrastructure, integrating technology into learning, and fostering interdisciplinary education. There was also a strong call for more collaboration between academia and industry to provide students with real-world experience and ensure that academic programs remain aligned with industry needs.

3. Role Models
Research also revealed the powerful impact of positive role models. When young women have access to visible and successful female role models in STEM, they are more likely to be inspired to pursue careers in these areas. The visibility of these role models is essential for motivating the next generation of female scientists, engineers, and innovators.

4. Programs targeting Under-served Communities
Research respondents suggested practical strategies to promote STEM education for women, including the increased visibility of female role models, targeted STEM outreach programs for girls, and scholarships for disadvantaged students. These efforts can help break down the barriers that often discourage girls and women from pursuing STEM careers.

C. Next Steps
From GENSTEMED project efforts, it may be concluded that Romania's leadership in ICT may offer a blueprint for expanding gender equity across all STEM domains, in Romania and beyond, in which context bridging the urban-rural divide should be a priority, with investments in infrastructure and targeted outreach to underserved regions. Mentorship programs, leadership training, and initiatives that foster entrepreneurship among women in STEM are also critical for sustaining progress. Aligning with EU frameworks such as the *Digital Decade Policy 2030* can provide valuable resources and support for these efforts, and beyond structural reforms, cultural shifts are essential. Namely, *increasing the visibility of female role models* and *promoting inclusive media narratives* can inspire and empower future generations. By scaling these initiatives, Romania can also build on its ICT successes and emerge as a leader in gender equity across the STEM ecosystem in Southeastern Europe, in the EU, and beyond.

In addition, it is clear that to achieve a vision of this kind will require a multifaceted approach that includes the following:
- **Policy Interventions:** Implementing policies that promote gender-sensitive teaching methods and curricula can enhance girls' participation in STEM from an early age.
- **Mentorship and Role Models**: Establishing mentorship programs and increasing the visibility of female role models in STEM can provide the necessary support and inspiration for girls and women to pursue and sustain STEM careers.
- Workplace Reforms: Creating inclusive workplace cultures that address discrimination and support work-life balance is crucial for retaining women in STEM professions.
- Continuous Monitoring: Regularly assessing the effectiveness of interventions like the foregoing, through data collection and analysis, will ensure that progress is being made and allow for adjustments as needed.

By adopting strategies like these, Romania can work toward further bridging the gender gap in STEM studies and careers, and can strengthen representation of women in the STEM workforce, in entrepreneurship, and in leadership across the board. It can thus harness the full potential of its talent pool for economic and societal advancement, and continue to provide a benchmark for "Gender and STEM" that is worth emulating in the region, in Europe, and globally.