

The Value of a Sustainable Development Network in Advancing Gender Equality at Higher Engineering Education*

Anastasia Zabaniotou^{1,2}

1. Department of Chemical Engineering, School of Engineering, Aristotle University of Thessaloniki, Greece

2. Réseau Méditerranéen des Ecoles d'Ingénieurs (RMEI), Ecole Centrale Marseille, France-UNESCO Chair 651-Innovation and Sustainable Development

Abstract: This article aims to outline the value of networking on gender equality change perspectives at higher engineering education institutions. It presents how the network of Mediterranean Engineering Schools (RMEI) took the leap towards learning and acting for a systemic social change, created a community of practice on gender equality, and inspired members to commit to SDG5 under the framework of sustainable development, alternatively to the classical university's approach, while it was enabled by the HORIZON 2020 TARGET project. The added value of the network comes from a) the existing co-sharing and collaboration conditions within the network, b) the ability to involve a range of multinational, multigenerational, multicultural stakeholders (professors, students, university's leaders, policy-makers, practitioners, administrators, researchers, etc.) in a volunteer participatory approach, c) the challenging of the melting of traditional boundaries around engineering institutions by moving from separate bureaucratic centrally managed bodies to interconnected ecologies of self-assembling collaboration among mutually beneficial partnerships, d) the offering of an environment where individual learners are becoming change agents to kick off the output phase of the other learners' metabolism.

Key words: network, higher education, engineering, Mediterranean, gender equality, TARGET project, sustainable development

1. Introduction

The Higher Engineering Education (HEE) of the 21st century calls for respect to the ecosystems and openness towards society, inclusion, and diversity [1]. Thriving for a sustainable world, gender equality (GE) is important, because it is acknowledged as a social value and human right. Women represent more than half of world's population, they can contribute to a sustainable present and future, while both men and

women engineers need to contribute equally towards bringing sustainable proposals for the societies [2].

Around many issues concerning work, education, and industrial production, food and agriculture, energy, and water, etc., dominant development pathways have often contributed to both unsustainability and gender inequalities. The ecological sustainability and social inequalities are being produced by development models that support the persistence of unequal power relations between women and men in all sectors including education [3]. However, countries cannot reach their full potential if women's potential does not fully participate in their society. Therefore, women's participation has become a key factor for success of all developmental programmes [4].

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Corresponding author: Anastasia Zabaniotou, Professor and Vice President of RMEI; research areas/interests: systemic sustainability and sustainable development, resilience, circular economy, bioeconomy, gender equality and engineering education. E-mail: azampani@auth.gr.

Gender Equality (EIGE) shows that the EU is improving in GE but with a score of 67.9 out of 100, which is at least 60 years away from reaching complete GE [5].

Advancing GE in academia addresses the loss of women across the career pipeline and the absence of women from senior academic, professional and support roles. Throughout history, change has been possible only through the contributions and dedication of many people connected in tight [6].

The objective of this study is to explore the values of networking in advancing the social change of GE at engineering education by navigating in the GE change processes of the Mediterranean Engineering Schools Network (RMEI) in learning and acting at the Mediterranean Engineering Education context.

2. Material and Methods

2.1 The RMEI Network

The Mediterranean Network of Engineering Schools (RMEI) was established in 1997 in France by around 100 Engineering Schools from different Mediterranean countries. The network later was affiliated to UNESCO UniTwin chair of Sustainable Development Innovations. The network embraces a diversity of cultures, religions, political and socio-economic differences that exist among the Mediterranean countries. Based on a strong set of common values among its members, and relations that are based on trust, the network envisions contributing to sustainable development (SD) and peace in Mediterranean region by bridging people through common history and values and engineering education.

2.2 The TARGET Project

RMEI is partner of the HORIZON2020 TARGET project which is a four-year project (2017-2021) for “*Taking a Reflexive Approach to Gender Equality for Institutional Transformation*”. The project aims to the advancement of gender equality in research and innovation by supporting a reflexive gender equality

policy in seven gender equality innovating institutions (GEIIs) in the Mediterranean regions, including the RMEI network (<https://www.gendertarget.eu/>).

2.3 Rationale

Although in Higher Education Institutions (HEI), female graduates exceed male graduates at the bachelor and master level and the doctoral level is gender-balanced, at the top of the academic pyramid women represent 13% being the EU-28 minimum). Women are still largely underrepresented at the level of full professorship [9].

Mediterranean countries have been characterized as relatively “inactive” in developing GE policies in higher education and research institutions. Traditional engineering schools across Mediterranean are characterized by patriarchal, hierarchical structures of command and control, in most of the cases, and gender bias exist [10, 11].

In general, higher education institutions should acknowledge gender inequality, increased responsibility, and actions for awareness-raising and more commitment to implementing truly inclusive gender equality policies [12]. Networks have a participatory and self-organising structure, giving them more legitimacy with members than top down initiatives imposed by management and can empower women and supportive men involved to change by providing a learning ground and practise networking with colleagues who can empathise with their issues [13].

RMEI network recognizes that GE is not only a fundamental human right but a significant factor for the sustainable and resilient development of societies and for enhancing the performance of businesses and institutions. With the support of TARGET project, the community of practice (CoP), RMEI is opting advances on GE and human rights, by empowering the participation of women in network’s and engineering schools’ leadership and operation, and other forms of collective action and engagement.

2.4 Methodology for the GEP

In this context, RMEI with the support of TARGET project has designed a tailored methodology to contribute to GE change, by taking the following paths:

- Leading awareness.
- Fostering collaborative learning and participatory acting.
- Building capacity and competence to reflect on practices and action plan.
- Electing a gender-balanced board of the network.
- Integrating the gender dimension in the network's policy.
- Catalysing the development of GE committees at the member-institutions.
- Building a community of practice (CoP).
- Harvesting GE benefits from the synergies with other SDGs innovations.

A strong potential regarding institutional change on GE is cultivating at two levels:

- 1) At the network level.
- 2) At members-institutions level.

An action research is taken to make aware of GE problems yet unidentified, to realize the need of changes, following the phases of:

- Realization and awareness of the wicked problem of GE in engineering education at the Mediterranean countries.
- Articulation of a shared common purpose.
- Diagnosis of the level of the problem by using a gender equality audit (GEA), data gathering (survey), feedback of results, and joint action planning.
- Transformation phase including actions relating to learning processes and to planning and inspiring changes in the network and at the members.
- Outputs phase including changes in individual's behaviour resulting from corrective action steps.

3. Results-RMEI Advances GE Changes at the Mediterranean Higher Engineering Education

The TARGET project started in May 2017. Knowing institutional workshops (KIW) and capacity building workshops (CBW) with the partners and experts have since been defining rules and procedures, thereby shaping the way RMEI implements a GE policy and plan and agreeing on the modalities of network's evaluation.

The network's GEP statement confirms the commitment expressed by the leaders of member-institutions to advance GE in their institutions in synergies with the sustainable development mission to secure a future for an inclusive higher engineering education in Mediterranean.

3.1 Gender Equality Plan (GEP)

The GEP aims at:

- 1) Organization of institutional workshops (IWs) focused on the development of knowledge, capacity, and competences.
- 2) Development of a GEP statement (GEPS) that presented for an open dialogue during the network's general assembly (GA); it approved unanimously.
- 3) Adoption of the GEPS in member-institutions.
- 4) Planning activities that have the potential to include many national stakeholders in an open dialogue on the member-institutions premises.
- 5) Inspiring structures for GE committees in member-institutions targeting more specific measures within the institution.
- 6) Creating a Mediterranean community of practice (CoP).
- 7) Changing the cultural bias in engineering education, thought activities and teaching.
- 8) Creating change agents by involving students in the process.

3.2 Monitoring, Self-Assessment and Evaluation

Based on TARGET project's evaluation framework and guidelines, a tailored, bottom-up and case-specific self-assessment process was developed tracing the empirically of the interventions. Tailored indicators to assess the GE progress, considering the systemic view of the cross-cutting gender analyses, interdependently connected to sustainable development goals (SDGs) innovations, were applied.

The developed of a GE working group has the following characteristics:

- Transparent leadership
- Good communication and collaboration
- Active learners within the network.
- Change agents at the member-institutions.
- Synergies of GE with other SDGs innovations.
- Commitment of members based on trust.
- Practitioner's character.
- Multi-stakeholder's participation.
- Best case-studies and exchange of best practices.
- Cultural narratives.
- New forms of learning in an ever-changing world.

4. The Value of Networking for GE Change at Engineering Education

We propose networks of engineering schools with the sustainable development mission as tools to strengthen GE change at higher engineering education for the following reasons:

4.1 Moving From Offsetting to Participatory Collaboration

A network asks for voluntary actions from all members. While offsetting creates a competition for the low-advanced institutions with high-advanced in GE, the nature of network calls for interdisciplinary collaboration, with volunteer members working together on GE development under a working group to exchange outcomes and best cases. Such collaboration

is effective since the network's GEP lies in the embedded willingness for SDGs implementation. This means that a large share of GE opportunities goes beyond national borders.

The network makes it easier for the member-institutions to take domestic action on GE, seeking institutional collaboration to reduce GE gaps and bias in all processes of the academic promotion, leadership and life, and tapping into the cultural and structural changes. Examples include: the change of network's policy when the adoption of this policy from one country helps the spillover effect in another country; when the creation of a GE committee in one institution inspires the creation of a related committee or centre in another member-institution.

4.2 Collecting New Data Under the Transparency Framework

The network's GE working group can propose a transparency framework for the disclosure and review of institutional data on GE and the implementation of GEP. This framework can invite engineering schools to report on their GE ambitions, using approaches that are based on a reflexive process. Most activities then can rely on these data not only to track progress, but also to identify mitigation options.

4.3 Elevating Ambitions

GE policies and institutional ambitions are more advanced in some countries due to related legislation's targets. More ambitious policies and new GE options are needed for less-advanced ones. The network's GEP therefore can include a procedure for regular updates of member-institutions GE ambitions, and can inspire members to enhance the ambition of their commitment to SDG5. This mechanism can provide an opportunity to introduce and encourage the use of GE strategies to bring equality, in a way that does require a deeper understanding of the GE change potential, but the members can make optimum use of network's capacity building by acting.

4.4 Creating a Common Territorial and Contexted Vision

The network should embed a vision towards a) helping future engineers, scientists, and managers (men and women) to become able for creative problem-solving and technical innovations at local and global level, that are environmentally and socially sound and to considers learning, training, research & innovation (R&I), in the context of co-creation and b) contributing to this transformation, knowing that global challenges are complex and interrelated, requiring interdisciplinary/transdisciplinary and system-thinking approaches, and c) respecting to the local cultures.

4.5 Promoting Structural Change

The network can invite member-institutions to adopt it and integrate it in their development strategies. This provides an opportunity to make GE a structural part of an institution's inclusion and diversity development ambition. In addition, by providing the holistic or systemic levers to transform higher education, GE can enhance the social character of Universities.

4.6 Introducing Capacity Building and Sharing Knowledge

GE changes require knowledge and best-case transfer, capacity-building, and finance. Moving away from a patriarchal model requires cultural and structural change into the University. Because of their potential to elevate the GE ambition, capacity building on GE should become the cornerstone.

4.7 Creating a Community of Practice

Building community and strengthening social capital is at the core of this type of network. Network weaving can help the working group to amplify its place-based efforts and work with local universities communities that span geographies connecting people to strengthen social ties. Therefore, contrary to universities, network's community of practice is not

always place-based. A network can connect leaders and cultural influencers from across geographies which can result in the feeling of communal belonging.

4.8 Opting a Transformative Change

GE change in institutions/universities is referring to a systemic change that involves cultural and structural change. Measuring a cultural change is complicated, because culture shares ideas, norms, and behaviours, common to a group of people inhabiting a geographic location. Thus, cultural change in an institutional context can be seen as a change in shared values.

Contrary to cultural change, institutional change includes rules and norms with power relationships to play an important part. To measure institutional change progress, the institution should be seen as a system with context and territorial characteristics. In this respect, systems change requires multi-disciplinary work, teamwork, creative thinking, flexibility to reach transdisciplinary outcomes. It also requires seeing the aspects of a transformative change that is a systemic change that can bring a shift from the wicked global challenges and inequalities, into equality in co-existence.

4.9 Creating a Spillover Effect

Gender roles are learned through social processes and have a strong impact on the GE progress in Universities. A network can catalyze the evaporation of some biases through the trustful interrelations, interactions, and interchanges among the members of and due to the behavioural spillover phenomenon which takes place where the adoption of one behavior causes the adoption of additional, related behaviors. Therefore, this phenomenon, can help individual learners to become change-agents to kick off the output phase of the other learners' metabolism.

4.10 Establishing GE Working Group and Advisory Boards

Such GE boards would provide guidance, tools,

training, and technical support to encourage and motivate networks to adopt strategies that promote GE. This can be succeeded by partnering in GE projects as it is the case of the TARGET project for RMEI. Gender aware and inspirational leaders of both sexes should support the GE working group implying the involving of all stakeholders (professors, students, etc.) in personal and network transformation.

4.11 Creating GE Leadership

Potential leaders (both women and men) who are willing to bring about GE change need to have a clear vision of the type of change envisaged and be willing to consistently push for GE in their university. Such persons will empower others to become ‘change agents’ to build a culture of leadership and learning founded on mutual respect and trust. A good leader is someone who has the power to inspire through the formation of positive relationships with others and empowering others to lead, mobilized collectively to support change within the network or member-institution [17].

4.12 Raising Awareness About the Benefits of GE Equality for the Implementations of all SDGs Innovations

GE and sustainability can powerfully reinforce each other in alternative pathways. Engineers of both sexes agencies and collective actions are central in managing technological innovations and services towards delivering livelihood and conservation benefits, to scale up capacity to reduce vulnerabilities to climate change. A network that envisions to offer a support for the creation of a “gender equality culture” for all involved members (professors, students, leaders of the engineering institutions, etc.) and to inspire GE in the member-institutions as a fundamental prerequisite to address the pressing global and local challenges of environmental, climatic, economic, and social dimensions, is acting as a bridge between GE and sustainability oriented engineering education.

4.13 Disrupt the Digital Stage and Coordinate Resources and Action

In the Covid-19 disruptive age, physical services are being replaced by online equivalents. This shows that in post Covid-19 period reduction in material use could optimise resource use and minimize expenses.

5. Conclusions

The study reflects on the GE co-creation processes and interventions by the RMEI network, suggesting networking as a new form for collaborative learning, ethical commitment to GE and synergetic effects arising from appropriately designed tailored policy mixes, as drivers for advancing gender equality in typical male-dominated engineering institutions.

RMEI working group on GE is a practice-driven creation, representing a pragmatic approach to SDG5 innovations, characterized by a reflexive approach of interventions in real-life, with the active involvement of uses (member-institutions), and the support (financial and experience-transferring) of the EU TARGET project.

It is shown that a network of engineering schools can create a dynamic inter-university instrument of trust with a purpose of enhancing the GE changes through self-organization and internal reform. It benefits from the existing co-sharing and collaborating conditions, and inspires a cultural and institutional/structural change by involving a range of stakeholders (policy-makers, practitioners, administrators, researchers, etc.).

A network is challenging the melting of traditional boundaries around engineering institutions, by moving from separate bureaucratic centrally managed institutions to interconnected ecologies of self-assembling networking and collaboration with mutually beneficial partnerships, where individual learners are becoming change agents to kick off the output phase of the other learners’ metabolism and finally create an ecosystem of metabolizing learners in the Engineering Education, life and societies.

In order for a network to catalyze a social change, participants need to work with a collaborative learning and acting mindset which is embedded in common values sharing, connectedness, shared ownership and openness, and to prioritize trust, transparency, relationships and belonging building, and distributed decision making. This distinguishes networks from universities where the pursuit of excellence and competition is more embedded in the process of learning.

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