Task 3: Database of Good Practices

A Global Approach to the Gender Gap in Mathematical and Natural Science: How to Measure it, How to Reduce It?

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Outline

- Aim and rationale for developing a database of good practices
- Methodology for developing the database
- Database structure
- Features of the database:
  - Regions and countries
  - Disciplines
  - Dimensions of "good practice"
- Examples of good practice
- What did we learn?

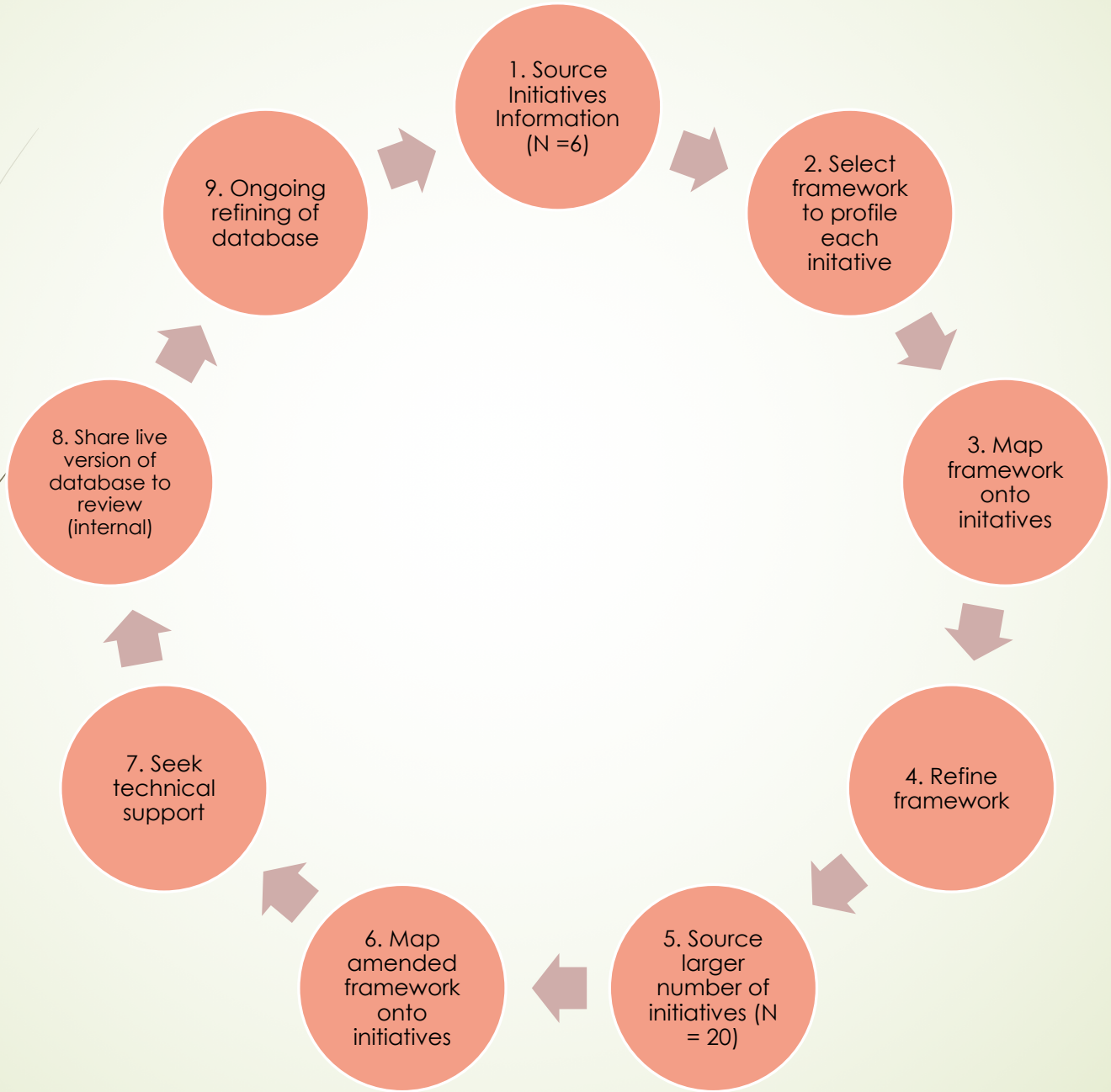
Aim

- To gather and make available information and resources on effective practices for enhancing the participation of girls and women in science at all levels.
- To gather and generate evidence about effectiveness of the collected practices.
- To investigate the extension of proven practices to
  - larger audiences;
  - different levels or age groups;
  - other natural sciences
- To develop, translate, and disseminate selected practices worldwide, focusing on contexts where participation of girls and women is particularly low.

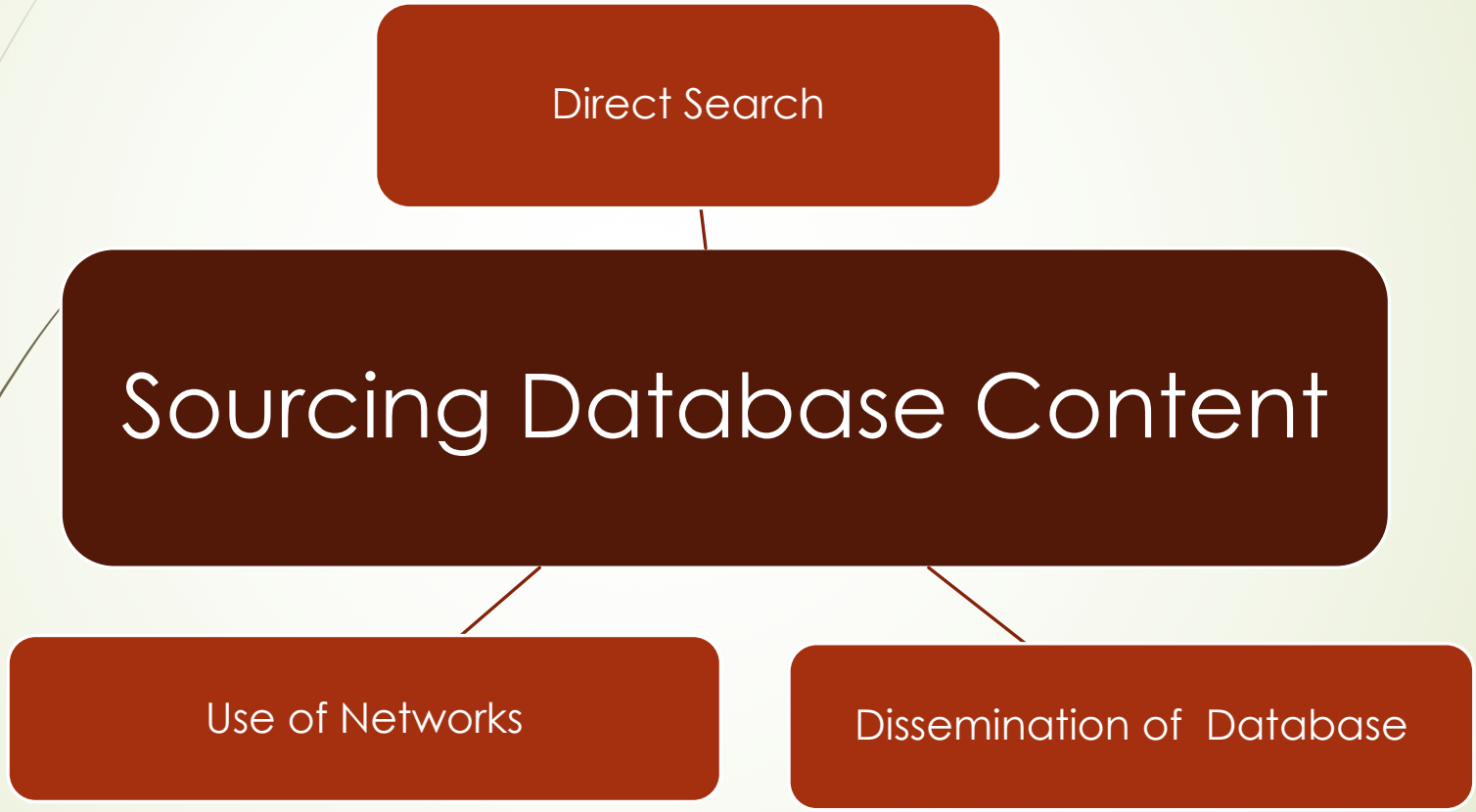
Rationale

- Addressing the gender gap in Science, Technology, Engineering and Mathematics (STEM) is a major goal of many countries.
- Initiatives that have been established to meet this challenge are broad ranging from intervention programmes in primary, secondary and tertiary education to industry-based interventions targeted at the workplace.
- Which work? What is the evidence? Can effective practices be used in other context? How do we know?
- It was intended that by collating a sample of these initiatives using an online database, users would be able to access information about a variety of initiatives that aim to address the gender gap in STEM.

Creating a Database



Strategies for Sourcing Database Information



Review of Other Databases

Name	Link	Initiative Type	Number of Initiatives	Funding
Plotina	http://www.plotina.eu/work-life-integration-good-practices/	Good practices for work and personal life integration	25	H2020
EIGE	https://eige.europa.eu/gender-mainstreaming/good-practices	gender mainstreaming strategies	97	EU Agency
Scientix	http://www.scientix.eu/projects	Science Education Projects	65 pages	H2020
WorldWideLearn	https://www.worldwidelearn.com/education-articles/15-innovative-initiatives-bringing-women-into-stem.html		15	
Soroptimist	https://soroptimist-projects.org/portfolio_category/healthandfoodsecurity/	Projects	4	
Practising Gender Equality in Science	http://www.pragesdatabase.eu/	Gender Equality in Science	109	FP7

Database structure

- Name, acronym, web link
- Year of origin
- Region/country
- Funding source
- Discipline(s)
- Target level
- Evidence of effectiveness and impact
- Dimensions of "good practice"

Regions and countries

Region and countries	Number of initiatives
African group: South Africa, Nigeria, Kenya, Ethiopia, Namibia	5
Asia-Pacific group: Japan, India, China, Philippines, United Arab Emirates	7
Eastern European group: Czech Republic, Poland, Ukraine, Hungary, Bulgaria	5
Latin American and Caribbean group: Brazil, Mexico, Chile, Colombia	5
North American group: United States of America, Canada	8
Oceania group: Australia, New Zealand	1
Western European group: France, Spain, United Kingdom, Germany, Netherlands, Italy, Serbia, Switzerland, Denmark, Ireland, Belgium, Austria, Sweden, Estonia, Finland, Norway, Portugal, Macedonia	21
American (North America, Mexico)	1
European (East, West)	1
Global	3
Scientific bodies	10
Total initiatives	67

Disciplines

Discipline	Number of initiatives
All disciplines	3
Mathematics	4
Science	7
Science (Physics)	4
Science and Engineering	4
Science and Technology	7
STEAM	2
STEM	24
Technology	12
Total initiatives	67

Dimensions of “good practice”

Conceptual Schema: Saga Toolkit

- The Saga Toolkit is a set of instruments that were designed to monitor and evaluate gender equality in policy documents.
- The Science, Technology and Innovation Gender Objectives List (STI GOL) was created with the intention of classifying policies and their associated instruments.
- For the purpose of establishing the database of STEM gender initiatives, the list of objectives and their sub categories were explored as a method to profile the gender initiatives of the database.

1. Change perceptions, attitudes, behaviours, social norms and stereotypes towards women in STEM in society

- 1.1. Promote awareness of and overcome non-conscious and cultural gender biases widely expressed as gender stereotypes, among scientists, educators, policy-makers, research organizations, the media, and the public at large. **Broaden to include raise awareness of equal opportunities**
- 1. 2. Promote visibility of women with STEM qualifications, and in STEM careers, especially in leadership positions in governments, business enterprises, universities, and research organizations.
- 1.3. Mainstream gender perspectives in science communication and informal and non-formal STEM education activities, including in science centres and museums.
- **1.4 Promote strategies that engage of families/communities in STEM careers promotion to girls might be contrary to cultural expectations and norms.**
- **1.5 Promote strategies that engage females in a community to develop scientific literacy and knowledge of social scientific issues.**

2. Engage girls and young women in STEM primary and secondary education, as well as in technical and vocational education and training

- 2.1. Promote S&E vocations to girls and young women, including by stimulating interest, fostering in-depth knowledge about S&E career issues, and presenting role models.
- 2.2. Mainstream the gender perspective in educational content (teacher training, curricula, pedagogical methods, and teaching material).
- 2.3. Promote gender-sensitive pedagogical approaches to STEM teaching, including encouraging hands-on training and experiments.
- 2.4. Promote gender balance among STEM teachers.
- 2.5 Promote gender equality in STEM school-to-work transitions.
- **2.6 Promote mentoring of young girls by higher education or career STEM professionals.**
- **2.7 Promote workshops that develop females' confidence and other skills (leadership, communication, and critical thinking)**
- **2.8 Promote equal access to subjects in single sex schools.**
- **2.9 Provide work shadowing opportunities in second level education..**
- **2.10 Promote networks of female students (secondary).**

3. Attraction, access to and retention of women in STEM higher education at all levels

- 3.1. Promote access of and attract women to STEM higher education **recruitment initiatives (information)** (including Masters and Ph.D.), including through specific scholarships and awards.
- 3.2. Prevent gender bias in the student admission and financial aid processes.
- 3.3. Promote retention of women in STEM higher education at all levels, including through gender-sensitive mentoring, workshops and networks.
- 3.4. Prevent gender-based discrimination and sexual harassment at all levels, including Masters and Ph.D.
- 3.5. Promote gender equality in international mobility of students.
- 3.6. Promote day care/child care facilities for students, particularly at STEM higher education institutions.
- **3.7 Promote mentoring of higher education students.**
- **3.8 Promote strategies that aim to develop female confidence and other skills (leadership, communication, and critical thinking).**
- **3.9 Provide training to undergraduates in outreach and advocacy in promoting STEM education**

4. Gender equality in career progression for scientists and engineers (S&E)

- 4.1. Ensure gender equality in access to job opportunities, recruitment criteria and processes.
- 4.2. Promote equal work conditions.
- 4.3. Ensure gender equality in access to opportunities in the workplace.
- 4.4 Promote work–life balance.
- 4.5 Promote gender equality in international mobility of post-docs and researchers, and facilitate women's return.
- 4.6. Promote gender balance in leadership positions in S&E occupations (including decision making and research).

4. Gender equality in career progression for scientists and engineers (S&E) continued.

- 4.7. Promote transformations of STI institutions and organizations (structure, governance, policies, norms and values) aimed at achieving gender equality. **This should be expanded to include obstacles that may be experienced by both male and females but are more detrimental to females, for example short term contracts (lack of benefits maternity leave etc.)**
- 4.8. Ensure gender equality in S&E professional certifications, in particular in engineering.
- **4.9 Promote mentoring of STEM professionals.**
- **4.10 Promote gender representation in the sector**
- **4.11 Promote gender bias training to STEM professionals.**
- **4.12 Promote initiatives that increase female STEM networks/role models at professional level.**
- **4.13 Promote scholarships and awards at professional level.**
- **4.14 Develop industry skillsets (for example, public speaking)**
- **4.15 Promote female networks**

5. Promote the gender dimension in research content, practice and agendas

- 5.1. Establish specific gender-oriented R&D programmes, including research on gender in STEM and on the gender dimension of the country's research agenda and portfolio.
- 5.2. Incorporate gender dimensions into the evaluation of R&D projects.
- 5.3. Promote gender-sensitive analysis in research hypotheses and consideration of sex of research subjects.
- 5.4. Promote gender responsive and gender-sensitive research dissemination and science communication, including through science centres and museums, science journalism, specific conferences, workshops, and publications.

6. Promote gender equality in STEM-related policy-making

- 6.1. Ensure gender balance in STEM-related policy design (decision makers, consultative committees, expert groups, etc.)
- 6.2. Ensure gender mainstreaming and prioritization of gender equality in STEM- related policy design, monitoring and evaluation.

7. Promote gender equality in science and technology-based entrepreneurship and innovation activities

- 7.1. Promote gender equality in access to seed capital, angel investors, venture capital, and similar start-up financing.
- 7.2. Ensure equal access to public support for innovation for women-owned firms.
- 7.3. Ensure visibility of women entrepreneurs as role models.
- 7.4. Ensure women's access to mentorship and participation in the design and implementation of gender-sensitive training in entrepreneurship, innovation management, and Intellectual Property Rights.
- 7.5. Promote networks of women entrepreneurs and women's participation in entrepreneurship networks.
- 7.6. Promote gendered innovation approaches.
- 7.7. Promote external incentives and recognition for women-led innovation and acceptance of women innovators in society.
- 7.8. Promote gender equality in the access and use of enabling technology, in particular information and communication technology.
- 7.9. Promote a gender balanced workforce and equal opportunities in start-up companies.

Distribution of "good practice" dimensions

Dimension	Number of initiatives
1. Social norms and stereotypes	21
2. Primary and secondary education	58
3. Higher education	25
4. Career progression	45
5. Research content, practice, and agendas	12
6. Policy-making processes	13
7. Entrepreneurship and innovation	6

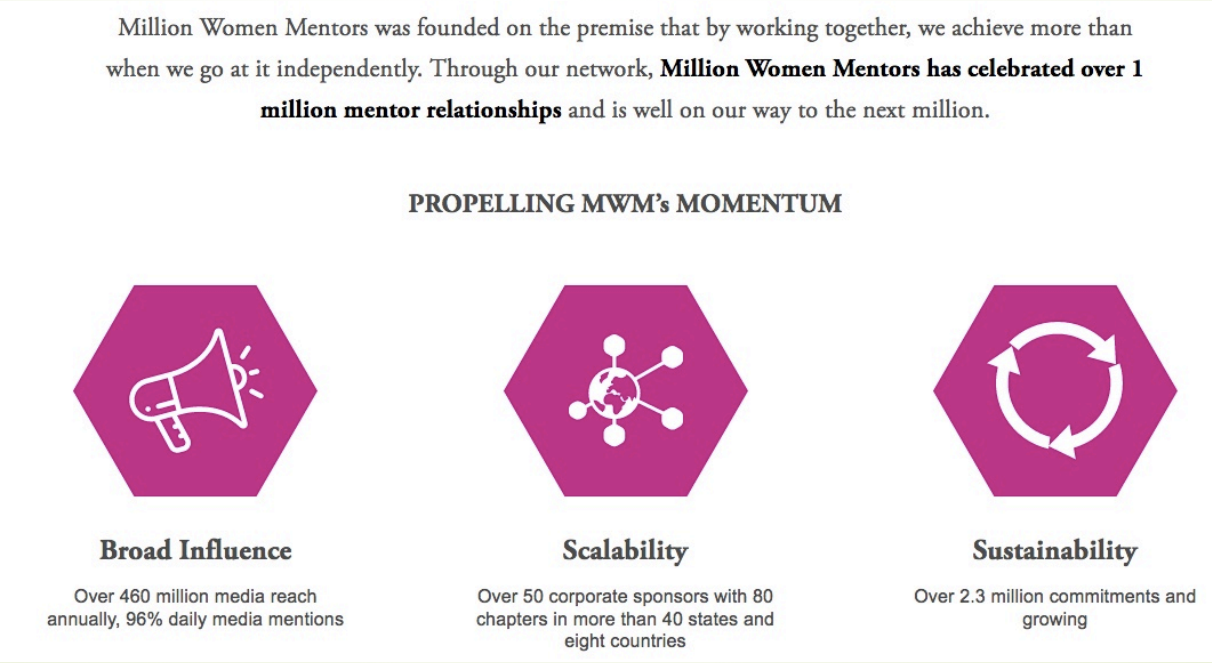
Distribution of "good practice" dimensions

Most commonly observed strategies (>10 entries in the database)"

- 2.1 Promote vocations to girls and young women in primary and secondary education (30 entries)
- 3.1 Promote access of, and attract women to, STEM in higher education (12 entries)
- 2.6 Promote mentoring of young girls by higher education or STEM professionals (11 entries)

Examples of good practice: Million Women Mentors

Million Women Mentors (MWM), an initiative of STEMconnector, is a national and global movement to spark the interest and confidence in women and girls to pursue STEM careers and leadership opportunities through the power of mentoring. (2.1, 2.6; North America)



Examples of good practice: #GirlsSTEM

20 Ukrainian women that gain great success in STEM industry joined the project to inspire and mentor the girls in Ukraine in choosing STEM education and career. Among them – top managers of IT and technology companies, academics, representatives of ministries, universities and NGOs, including lady managers from such international companies as SAP, Microsoft Ukraine, Luxoft Ukraine, GlobalLogic, Fujikura etc. (2.6, Ukraine)

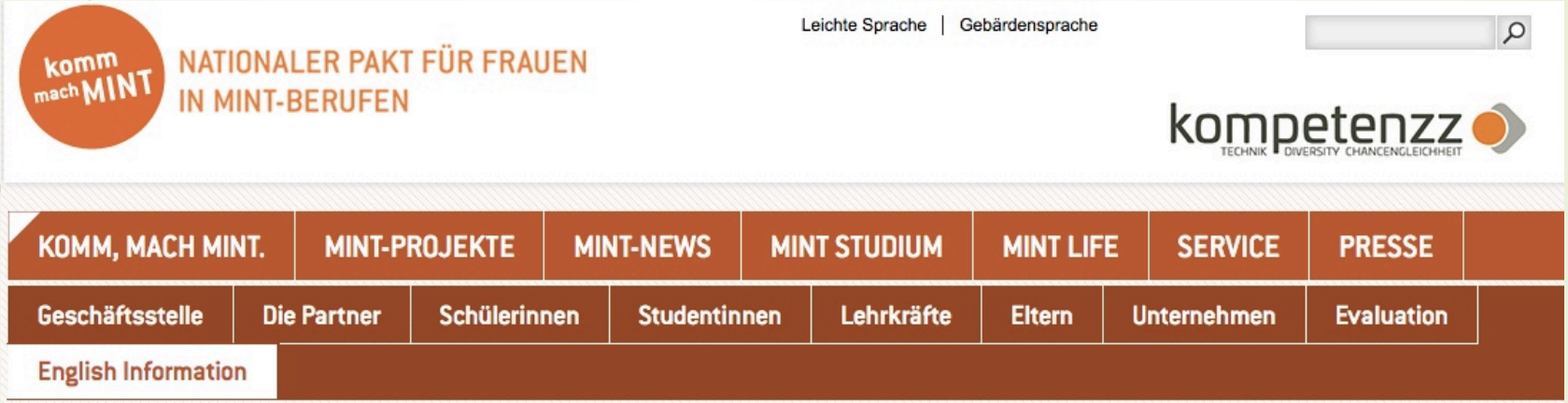
Examples of good practice: Girls in Science Project

The "Girls in Science" project aims to encourage girls to look at careers in science and technology (S&T), and to encourage women who have already chosen these careers to persist and become a viable part of Brazil's scientific and technological development. This objective is monitored through the training of students and undergraduates to encourage them to share their love science and technology by doing astronomy, physics and robotics in public schools. (2.1, Brazil)

Examples of good practice: Gender Equality Admissions Program

The Faculty of Physical and Mathematical Sciences of the University of Chile implemented the Gender Equity Priority Entry Program (PEG), an initiative to improve female participation and thus eliminate cultural biases that have historically limited their choice and development options. The PEG has an offer of special quotas in the Common Engineering and Science Plan for the first fifty-five (55) female applicants who are on the waiting list. (3.1, Chile)

Examples of good practice: Go MINT



Go MINT (Mathematics, Informatics, Natural Sciences, and Technology) aims to increase young women's interest in scientific and technical degree courses and attract female university graduates into careers in business. More than 300 partners are supporting this aim with a wide range of activities and initiatives to advise young women on their studies and career. (3.1, Germany)

Examples of good practice: Girl Project Ada

The Girl project Ada is a Norwegian University of Science and Technology (NTNU) project that aims to promote the education of more female engineers and master's graduates from the Faculty of Information Technology, Mathematics and Electrical Engineering (IME) at NTNU. Ada works towards this goal by using marketing, so that more women apply for the programmes, and by contributing to help students who start one of our programmes to complete their studies. (3.1, Norway)

What did we learn?

Need to modify categories (sub categories of SAGA STI Gender Objectives).

- Categories need to align with the general interests/concerns of target audience. For example, interest, career, mentor, scholarships

What features are important to include in the database?

- **Key information only** to categorise initiatives. Link to initiative will contain all the up to date information.
- **Easy to navigate**, use of drop down menus to select search criteria
- Option to **submit an initiative** to grow the database.
- Option to **verify** information

What did we learn?

'Evidence of Effectiveness' and 'Impact' are difficult to identify.

- Not correct to say there is no evidence of effectiveness in cases where there are no publications/reports listed.
- Only 10/67 initiatives had measured the impact of the programme.
- Providing evidence of impact is important for project managers, potential participants, stakeholders, policy makers, and funders.

Defining research impact

…the demonstrable contribution that research makes to the economy, society, culture, national security, public policy or services, health, the environment, or quality of life, beyond contributions to academia. (Australian Research Council, 2012)

Impact:
Benefit beyond academia

What resources did they have?	What did they do?	What did they produce?	How were the outputs used?	What changed or improved?
Budget, staff, infrastructure	Research project Teaching innovation Professional development (see STI GOL)	Resources for teachers Programs for students Publications	Uptake of resources Change in policy Research incorporated into teacher education	Greater female participation in STEM? Improved teaching practice? Changes in attitudes and perceptions?

Initiatives providing evidence of impact

- Institute of Physics Project Juno http://www.iop.org/about/diversity/initiatives/juno/index.html
- WiSci Girls' STEAM Camps https://www.girlup.org/wisci/ - sthash.M3Os02F3.dpbs

Feedback is very welcome

- A pilot version of the database is available at https://www.mathunion.org/cwm/gender-gap-in-science-database