

W-STEM: Building the future of Latin America: engaging women into STEM

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D2.1.2 STEM Gender Equality Self-Analysis Report

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Introduction

The objective of the W-STEM project [1-18] self-analysis gender report is to measure gender equality in enrolment and retention rates in undergraduate programs in natural sciences and mathematics, information and communication technology, and engineering, manufacturing, and construction (STEM programs) [19, 20].

The importance of such a measurement is for the 15 participating institutions (Table 1) to have a baseline to consider when preparing their action plans for years 2 and 3 of the project.

Table 1: Participant Institutions

P1	Universidad de Salamanca - USAL (Spain)
P2	Universidad del Norte - UNINORTE (Colombia)
P3	Oulu University - OULU (Finland)
P4	Politecnico di Torino - POLITO (Italy)
P5	Technological University Dublin - TUD (Ireland)
P6	Northern Regional College - NRC (United Kingdom)
P7	Tecnológico de Monterrey - ITESM (Mexico)
P8	Universidad de Guadalajara - UDG (Mexico)
P9	Universidad Técnica Federico Santa María - UTFSM (Chile)
P10	Pontificia Universidad Católica de Valparaíso - PUCV (Chile)
P11	Universidad Tecnológica de Bolívar - UTB (Colombia)
P12	Instituto Tecnológico de Costa Rica - ITCR (Costa Rica)
P13	Universidad de Costa Rica - UCR (Costa Rica)
P14	Universidad Técnica Particular de Loja - UTPL (Ecuador)
P15	Universidad Técnica del Norte - UTN (Ecuador)

To achieve this objective, we prepared a Self-Assessment matrix to collect information at each institution. This tool is based on the UNESCO SAGA Toolkit [21], which provides a framework to assess the effects of gender equality policies and instruments in science, technology and innovation by means of indicators that measure the gender gap in STEM related fields. The self-assessment matrix collects mainly quantitative information on undergraduate programs, but also includes complementary information on policies and the higher education context of each country.

This document describes the instrument and reviews the main quantitative information collected at all participant institutions on access, attraction, guidance, and retention of women in STEM programs.

Description and scope of the self-assessment instrument

The self-assessment matrix considers a subset of the SAGA Indicator Matrix [21] (SAGA Working Paper 2, table 8, p. 57-59) that were pertinent to W-STEM project goals having a focus on undergraduate higher education (indicators 4 to 26). Our self-assessment matrix retained the original numbering of the SAGA toolkit for ease of comparison. One indicator (number 9) was modified to exclude multiple educational levels (as information is only being collected for the undergraduate level). Two new indicators were created, one which extends indicator 9 to include first-year student retention (number 46) and the other which adds a measure of student dropout (number 47).

The survey was organized in 26 sections. The first section identifies the reporter of information and specifies the programs that will be included in the data collection process. The next 2 sections quantify the number of staff (instructors/faculty) teaching first year undergraduate students (number 4), and the total amount of undergraduate students per field at each institution (number 5). The most relevant sections of the survey are those that relate to attraction (number 6), access and enrollment (numbers 7 and 8), and guidance and retention (numbers 14, 15, 46 and 47). The remaining sections considered in the survey relate to complementary information (such as career breaks, sexual harassment events, scholarships, or international mobility) and contextual information for tertiary education. These are described in Table 2.

The self-assessment matrix is designed to collect data both in an aggregated manner and by each STEM program (categorized following the ISCED-F 2013 variants [22]¹. Information is gathered on the undergraduate level only (bachelor's degree or equivalent) and pertains specifically to the 2018 student intake with a focus on their first year of studies (academic year 2018 – 2019).

Table 2: Main sections of self-assessment instrument

N°	SECTION & SAGA INDICATOR NBR	CONTENT
1	PROGRAMMES	Programmes / courses are you using for data collection Unique multidisciplinary STEM programmes that intend to attract especially female students Length of programmes (years/months)
2	4. STAFF	Number of teaching staff members (female and total) for first year programmes, by field of study Number of staff (female and total) trained on gender equality issues in education

¹ The International Standard Classification of Education (ISCED) is a framework for assembling, compiling and analyzing cross-nationally comparable statistics on education. It has been designed as a three-level hierarchy between broad fields (the highest level), narrow fields (the second level) and detailed fields (the third level) and uses a four-digit coding scheme. The ISCED fields of education and training 2013 document may be obtained at <http://uis.unesco.org/sites/default/files/documents/isced-fields-of-education-and-training-2013-en.pdf>

		Related policies: Training on gender issues education provided for staff in STEM programmes // Benefits provided for its staff advancing their gender competence
3	5. STUDENTS	Number students (female and total) by field
4	6. ATTRACTION	Number of applicants (female and total) and related policies
5	7. ACCESS	Number of applicants accepted (female and total) and related policies
6	8. ENROLLMENT	Number of applicants enrolled (female and total) and related policies
7	9. GRADUATES	Total number of graduates (female and total)
8	10. NOMINATIONS FOR SCHOLARSHIP AND AWARD	Number of nominations for scholarships (female and total) and related policies
9	11. APPLICATIONS TO SCHOLARSHIPS AND AWARDS	Number of applicants for scholarships and awards (female and total) and related policies
10	12. RECIPIENTS OF SCHOLARSHIPS AND AWARDS	Number of recipients of scholarships and awards (female and total)
11	13. TERTIARY EDUCATION	Number of populations with tertiary education by age
12	14. DISCRIMINATION	Number of reported (by female and total) discrimination events and related policies
13	15. SEXUAL HARASSMENT	Number of reported (by female and total) sexual harassment events and related policies
14	16. APPLICANTS TO FUNDING FOR INTERNATIONAL MOBILITY	Number of applicants for international mobility (female and total) and related policies
15	17. RECIPIENTS TO FUNDING FOR INTERNATIONAL MOBILITY	Number of recipients to funding for international mobility (female and total)
16	18. PARTICIPANTS TO INTERNATIONAL MOBILITY PROGRAMMES	Number of participants to international mobility programmes (female and total)
17	19. RE-ENTRY GRANT APPLICANTS AFTER CAREER BREAKS	Number of applicants for re-entry after career breaks (female and total) and related policies
18	20. RECIPIENTS FOR RE-ENTRY GRANT AFTER CAREER BREAKS	Number of recipients for re-entry grant after career breaks (female and total)
19	21. DAY AND CHILD CARE FACILITIES	Total use of day and childcare facilities Number of men taking a child/children to day and child care facilities and related policies
20	22. SCIENCE & ENGINEERING OCCUPATIONS	Number of workers in S&E occupations in your country

21	23. TERTIARY EDUCATED IN S&E OCCUPATIONS	Number of tertiary educated and employed as professionals or technicians (S&E occupations) as a percentage of tertiary educated people
22	24. GROSS ANNUAL EARNINGS	Gross annual earnings by sex; field of R&D; occupation; economic activity e.g. (NACE)
23	25. APPLICANTS OF ENGINEERING CERTIFICATION	Number of applicants for engineering certification (female and total) and related policies
24	26. RECIPIENTS OF ENGINEERING CERTIFICATION	Number of recipients of engineering certification (female and total) and related policies
25	46. GUIDANCE	Number of applicants (female and total) who enrolled in first year Number of students graduated by field of study (female and total) Related policies
26	47. DROP-OUTs	Total drop-out on first year (female and total) and related policies A brief description of the student drop-out procedure at your university with a specification if there are preventing measures at place

The full questionnaire [23] is implemented as a worksheet that each institution completes to the level of detail available at their institution.

Data collection process

Once the instrument was constructed and piloted in one of the universities, the self-assessment matrix was distributed, and the collection followed the chronogram as indicated below (year 2019).

- March 25: Partner discussion on survey design takes place during kick off meeting
- April 26: Preliminary survey spreadsheet is shared for discussion with partners
- May 29: First proposal spreadsheet form for the survey is shared with partners
- July 3: Final spreadsheet form for the survey and Instruction notes is submitted
- October 9: Questions to survey process are collected
- October 17: Responses to questions are sent
- October 30: Cloud space is created to receive completed surveys from institutions
- November 20: First 12 surveys are available
- November 25: Presentation of preliminary results at Cartagena Summit Meeting
- December 15: Last surveys received
- December 15: Final analysis and reporting

The main difficulty reported regarding data collection is the availability of information in a centralized place at the institutional level. Other issues include confidentiality norms on sensible information, and scarcity of national context information.

Main results

Different institutions provided different degrees of detail in their surveys. Only some were able to disaggregate by fields of study, and other did not have detailed information, not even at the broad field of the ISCED classification. From the 26 sections, we present those with the most available information across institutions, that are related to attraction, access, and retention. Only aggregate information is provided.

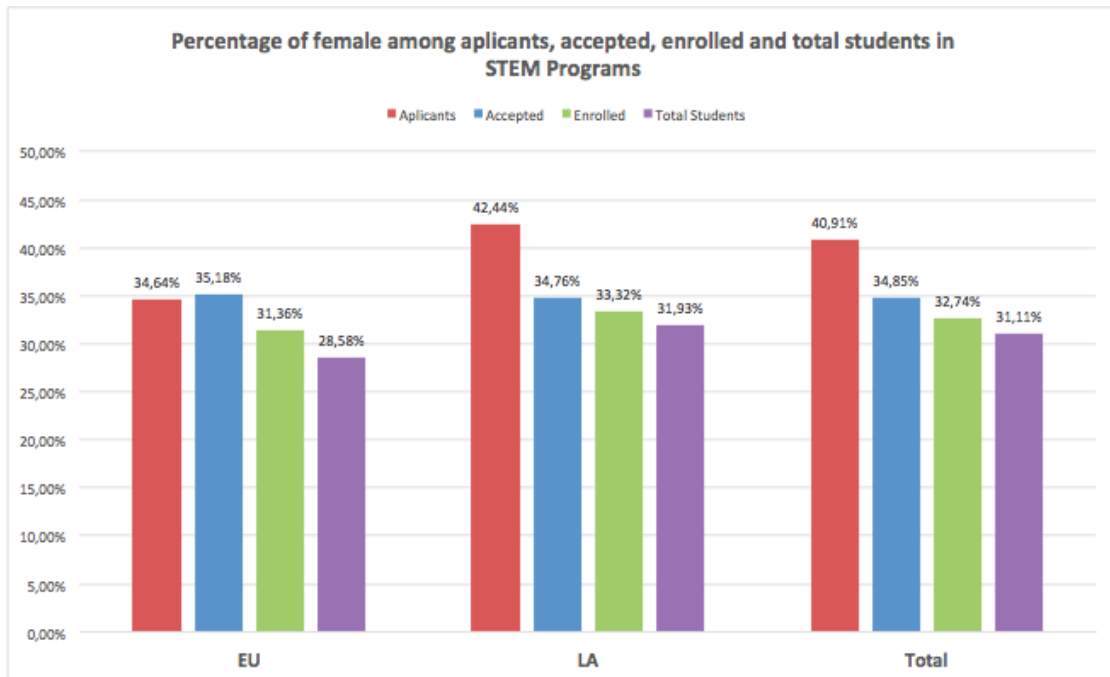
Most universities report a ratio of less than one third of female students enrolled in their STEM programs, the most variance observed among European universities (see Result 1 below). The percentage of female staff teaching first year students is slightly over one third of teachers, the most variance found among Latin American institutions (see Result 2 below).

Results 3, 4 and 5 (below) show details on how the percentage of women change between 2018 applicants to STEM programs (attraction), and those accepted and enrolled (access). One might expect this percentage to remain relatively constant, however, interestingly enough, it does not (see Summary of results). Few institutions show an increase between application and access (USAL, POLITO, UCR, UTN) and most others show a slight decrease (total observed 5% decrease is mostly influenced by UTPL's decrease from 42 to 6%). This percentage also decreases for most universities (except for UCR and UTN) between acceptance and actual first year enrollment.

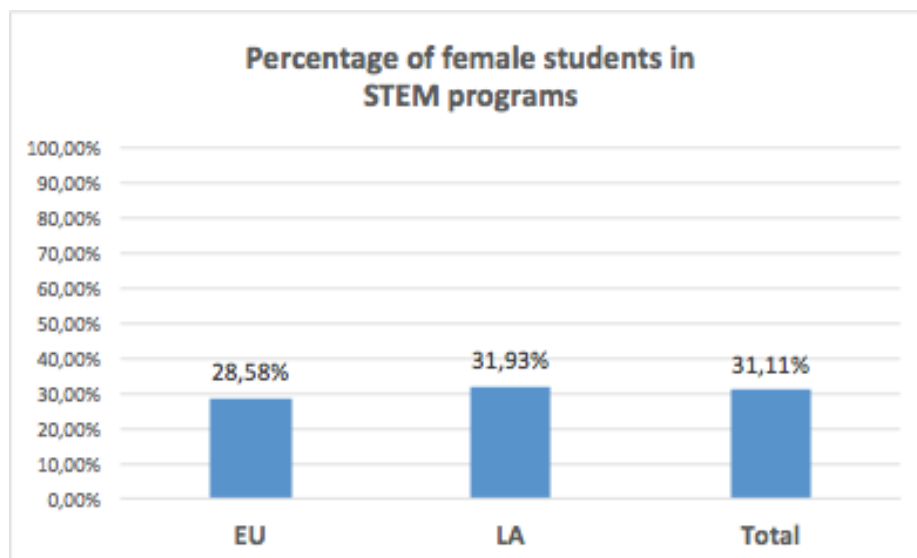
The percentage of female students enrolled in all STEM programs (all years) is also significantly lower than first year students (Result 1). This may support the need for retention programs for women in STEM careers; that may include guidance, mentoring, support, and other engagement programs.

The main implications of results 3, 4 and 5, however, are that not all accepted women finalize their registration. Thus, along with attraction campaigns to increase applications, institutions should explore their access policies and other causes for women not to enroll after they have been accepted.

Summary of Results

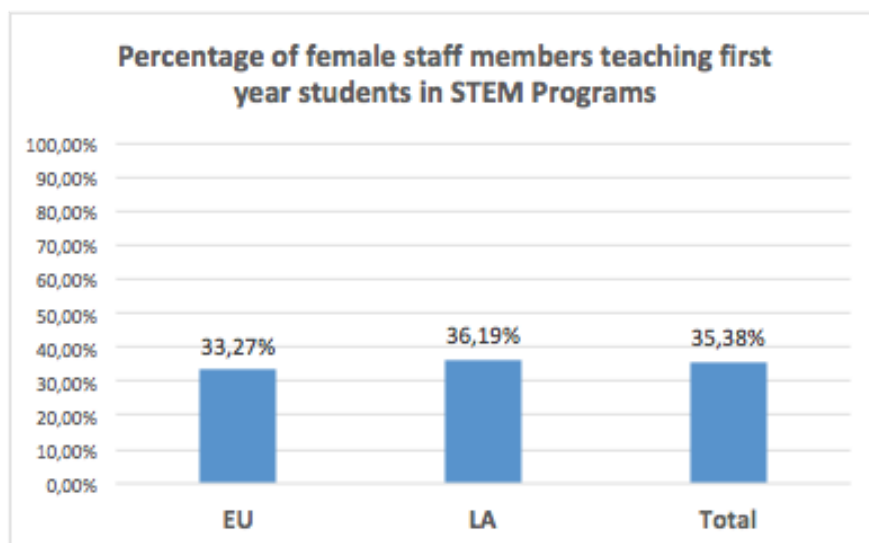


Result 1. Number of students



GROUP	INSTITUTION	Total number students	Total number of female students	% FEMALE
EU	Northern Regional College	227	111	48.90%
	Oulu University	5727	1746	30.49%
	Politecnico di Torino	20499	5745	28.03%
	Technological University Dublin	7865	1789	22.75%
	Universidad de Salamanca	4921	1825	37.09%
	Total EU		39239	11216
LA	Instituto Tecnológico de Costa Rica	8855	2837	32.04%
	Pontificia Universidad Católica de Valparaíso	7887	2244	28.45%
	Tecnológico de Monterrey	47271	15945	33.73%
	Universidad de Costa Rica	7047	2693	38.21%
	Universidad de Guadalajara	29258	8823	30.16%
	Universidad del Norte	4873	1663	34.13%
	Universidad Técnica del Norte	6180	1965	31.80%
	Universidad Tecnológica de Bolívar	2922	851	29.12%
	Universidad Técnica Federico Santa María	4608	1157	25.11%
	Universidad Técnica Particular de Loja	1929	405	21.00%
	Total LA		120830	38583
Total		160069	49799	31.11%

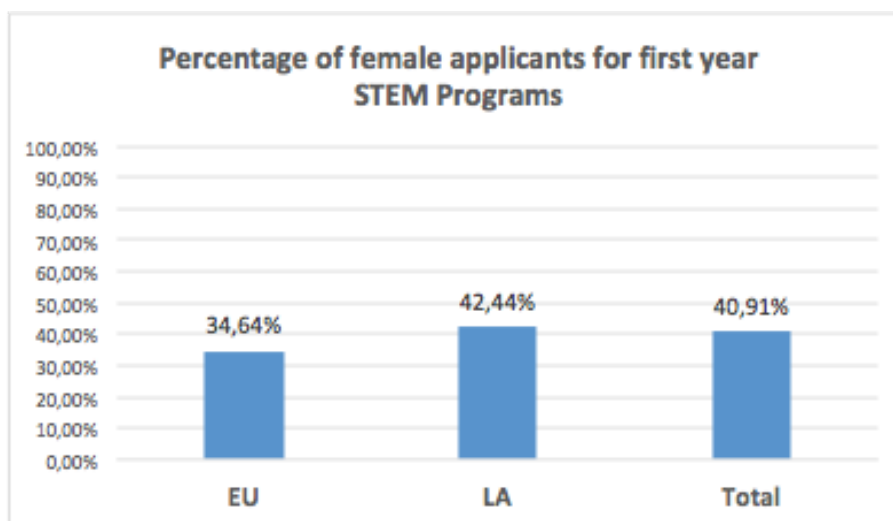
Result 2. Teaching staff members for first year students



GROUP	INSTITUTION	Total number of teaching staff members for first year	Total number of female teaching staff members for first year	% FEMALE
EU	Northern Regional College	16	7	43.75%
	Oulu University	553	189	34.18%
	Politecnico di Torino	405	143	35.31%
	Technological University Dublin	1234	395	32.01%
	Universidad de Salamanca	434	145	33.41%
	Total EU	2642	879	33.27%
	LA	Instituto Tecnológico de Costa Rica	158	34
Pontificia Universidad Católica de Valparaíso		722	271	37.53%
Tecnológico de Monterrey		3493	1563	44.75%
Universidad de Costa Rica		824	228	27.67%
Universidad de Guadalajara				-
Universidad del Norte		703	184	26.17%
Universidad Técnica del Norte		317	79	24.92%
Universidad Tecnológica de Bolívar		56	12	21.43%
Universidad Técnica Federico Santa María		641	128	19.97%
Universidad Técnica Particular de Loja		33	15	45.45%
Total LA	6947	2514	36.19%	

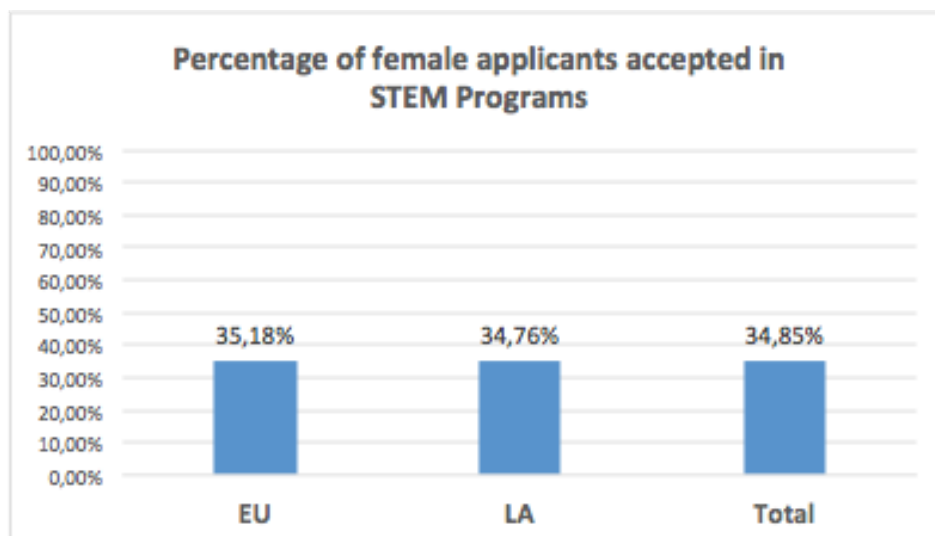
Total		9589	3393	35.38%
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Result 3. Attraction: Applicants for 2018 intake



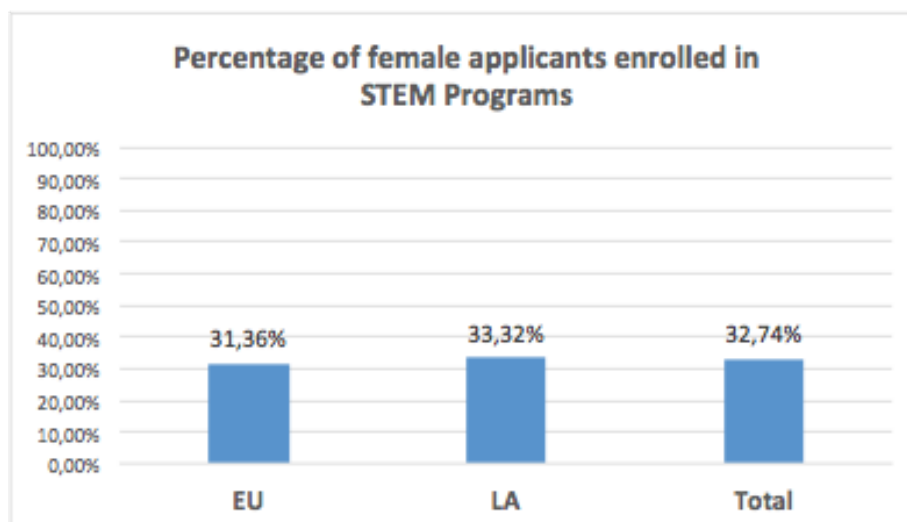
GROUP	INSTITUTION	Total number of applicants for first year	Total number of female applicants for first year	% FEMALE
EU	Northern Regional College	469	265	56.50%
	Oulu University	5940	2298	38.69%
	Politecnico di Torino	13850	4273	30.85%
	Technological University Dublin			-
	Universidad de Salamanca	2287	973	42.54%
Total EU		22546	7809	34.64%
LA	Instituto Tecnológico de Costa Rica	16089	6886	42.80%
	Pontificia Universidad Católica de Valparaíso	7753	2307	29.76%
	Tecnológico de Monterrey	53608	24330	45.39%
	Universidad de Costa Rica	4031	1609	39.92%
	Universidad de Guadalajara	21740	-	-
	Universidad del Norte	2673	948	35.47%
	Universidad Técnica del Norte	1292	403	31.19%
	Universidad Tecnológica de Bolívar	483	165	34.16%
	Universidad Técnica Federico Santa María	1642	501	30.51%
	Universidad Técnica Particular de Loja	4501	1929	42.86%
Total LA		113812	39078	42.44%
Total		136358	46887	40.91%

Result 4. Access: Applicants Accepted in 2018 intake



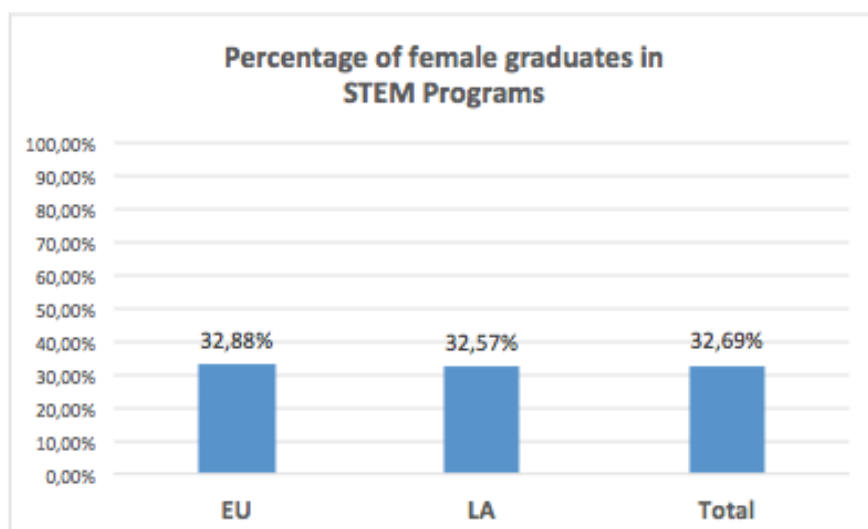
GROUP	INSTITUTION	Total number of applicants accepted	Total number of female applicants accepted	% FEMALE
EU	Northern Regional College	227	111	48.90%
	Oulu University	1237	455	36.78%
	Politecnico di Torino	7787	2455	31.53%
	Technological University Dublin			-
	Universidad de Salamanca	2153	991	46.03%
	Total EU		11404	4012
LA	Instituto Tecnológico de Costa Rica	2211	770	34.83%
	Pontificia Universidad Católica de Valparaíso	1972	566	28.70%
	Tecnológico de Monterrey	17549	6849	39.03%
	Universidad de Costa Rica	1420	593	41.76%
	Universidad de Guadalajara	8863	2810	31.70%
	Universidad del Norte	2481	872	35.15%
	Universidad Técnica del Norte	903	303	33.55%
	Universidad Tecnológica de Bolívar	351	109	31.05%
	Universidad Técnica Federico Santa María	1335	406	30.41%
	Universidad Técnica Particular de Loja	1350	81	6.00%
	Total LA		38435	13359
Total		49839	17371	34.85%

Result 5. Access: Applicants Enrolled in 2018 intake



GROUP	INSTITUTION	Total number of applicants enrolled	Total number of female applicants enrolled	% FEMALE
EU	Northern Regional College	227	111	48.90%
	Oulu University	1077	387	35.93%
	Politecnico di Torino	5225	1562	29.89%
	Technological University Dublin	1863	476	25.55%
	Universidad de Salamanca	989	406	41.05%
Total EU		9381	2942	31.36%
LA	Instituto Tecnológico de Costa Rica	1637	507	30.97%
	Pontificia Universidad Católica de Valparaíso	1920	537	27.97%
	Tecnológico de Monterrey	12307	4517	36.70%
	Universidad de Costa Rica	1105	480	43.44%
	Universidad de Guadalajara	11874		-
	Universidad del Norte	1152	368	31.94%
	Universidad Técnica del Norte	1704	583	34.21%
	Universidad Tecnológica de Bolívar	351	109	31.05%
	Universidad Técnica Federico Santa María	978	289	29.55%
	Universidad Técnica Particular de Loja	1249	75	6.00%
Total LA		34277	7465	33.32%
Total		43658	10407	32.74%

Result 6. Retention: Graduates during 2018



GROUP	INSTITUTION	Total number of graduates	Total number of female graduates	% FEMALE
EU	Northern Regional College	606	388	64.03%
	Oulu University	525	225	42.86%
	Politecnico di Torino	3844	1165	30.31%
	Technological University Dublin	1782	423	23.74%
	Universidad de Salamanca	862	304	35.27%
	Total EU		7619	2505
LA	Instituto Tecnológico de Costa Rica	862	321	37.24%
	Pontificia Universidad Católica de Valparaíso	848	308	36.32%
	Tecnológico de Monterrey	4036	1395	34.56%
	Universidad de Costa Rica	600	223	37.17%
	Universidad de Guadalajara	3820	1091	28.56%
	Universidad del Norte	515	178	34.56%
	Universidad Técnica del Norte	348	113	32.47%
	Universidad Tecnológica de Bolívar	278	86	30.94%
	Universidad Técnica Federico Santa María	469	123	26.23%
	Universidad Técnica Particular de Loja	100	30	30.00%
	Total LA		11876	3868
Total		19495	6373	32.69%

Lessons and recommendations

Data collection for comparison purposes is a serious task that requires rigor and organization. This kind of data, taken regularly, is valuable when measuring policy impact. The first lesson of this self-assessment exercise is that universities do not consistently gather information by gender, nor do they centralize information in a unique office. Many of the SAGA indicators are not reported nor stored consistently. One takeaway is that reporting procedures may be revised to consider registering information by gender. Institutions could benefit from a map summarizing the different sources of information required for completing this questionnaire again, and a plan for regular data collection of these relevant indicators so that a future version of this report may be completed for all sections of the survey.

The main purpose of this survey is for each institution to understand their baseline in relevant indicators associated to attraction, access and retention. Aggregated data, although useful, is not enough for an efficient use of resources when designing attraction access and retention activities and policies, as different STEM programs have different requirements and gender gaps. Several institutions considered that the ISCED2013 classification was too narrow, and preferred reporting on their individual programs. This, although adequate for internal use, is not helpful for comparison between universities as often undergraduate programs have different denominations. Working on a standard report requires additional training across universities.

The main results indicate that new instruments may be helpful in understanding female student's motivations towards STEM careers and to learn about their experiences throughout higher education programs, in order to improve attraction, access and retention campaigns and policies. Such reporting processes should also become regular practice improvement is to be measured over time.

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