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The Academic Profession from a Gender Perspective in Science, Technology, Engineering, and Mathematics in Mexico

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Abstract

This is a descriptive and comparative document obtained from a national database resulting from the "APIKS", Academic Profession in the Knowldge-Basic Society survey which analyses the incidence in Science, Technology, Engineering, and Mathematics, from the perspective of professors in Mexican universities. We will analyse the inclusion of women in research. Also, we will describe the changes that have been occurring in the forms and conditions of academic work, activities, performance, productivity, and degree of satisfaction nationwide. The sample that was studied was 3776 professors from the different higher education subsystems.

Keywords

Higher Education, Professors, Teaching, Research, Women

1. Introduction

This research was conducted by means of a descriptive and comparative nationwide study related to STEM education, where our main interest is the evolution of the academic profession in the country. We will discuss the incidence in the implementation of STEM in universities nationwide, with a representative focus on women and their performance in this area. Taking as an immediate reference the last national survey conducted in 2007, by the study called Reconfiguration of the Academic Profession in Mexico (RPAM) with the participation of 22 countries (Rubio, 2007). Before this, the 1991-1992 International Carnegie Foundation Survey, a study on the Advancement of Teaching (CAP) with the participation of 14 countries. Finally, the database used for this research corresponds to the

APIKS survey, applied in 30 countries (Estévez et al., 2020).

In the last couple of years, there has been some work done on the integration of females in education. However, there is still a long way to go before equality is reached, even much more in the higher levels which are still dominated mainly by men, especially in research areas (D'Isanto, Barone, & Masullo, 2021). Having said this, in Mexico despite the existing gender inequality, some results have been obtained, which generates an important development. It is important to highlight that a current point in the education policies' agenda is to increase the representation of women in higher positions within the different universities in the country.

Nowadays, the United Nations (UN) in its 2030 agenda for sustainable development stated that gender equality is a key element, agreeing with the UNESCO. According to the National Commission to Prevent and Eradicate Violence Against Women, the definition of Gender is "the social attributes and opportunities associated to being a man or woman". Likewise, the UNESCO defines "gender equality" as the existence of equal opportunities and rights between men and women. This integration is necessary in every sphere and education level, since that is how one can really achieve a real change in society as per Araya (2021). It is key to integrate STEM education into this system, which is a worldwide trend that seeks to provide the skills to all every child and young adult so that they can face the challenges they are presented with in the future (Rojas, 2019). This results in the need to create and modify policies that will foster the educational opportunities for women in every level (Mayorga, 2018). If we focus on those households where the parents have a high education level, it is more likely that the children will maintain or exceed that level (Galaz et al., 2012). In other words, the world scope is of vital importance in the sustainable development of higher education, beginning with teaching. It is very important to have gender equality and at the same highlight as a priority the importance of quality education and an integration of the different areas with the purpose of achieving a sustainable society (Ramos, 2020).

The European Union has sought since the year 2000, through public and social policies, to promote and support women in every aspect, among social, educational, and labor. There has been a noticeable development in their presence in the different areas. However, this is not enough due to the fact that the figures continue showing a higher number of men, especially teaching in Higher Education Institutions. For example, Italy continues to show great asymmetry between both genders (Bozzon et al., 2017) Slovenia on the other hand, has developed an outstanding education system. Higher education has benefited greatly. This promotes development and productivity in the institutions. However, they have been unable to equal the number of academic men and women (Klemenčič et al., 2015) even though the number of women graduating with STEM postgraduate studies has successfully increased for women (Matarranz & Ramírez, 2018). Agreeing with Lozano, Iglesias, & Martínez (2016) related to the fact that public policies and regulations on education and non-discrimination, end up generat-

ing a very different result in practice; where there is a strong difference between the number of men and women working in teaching and research activities, where without a doubt it is more difficult for a woman to be able to move up on the hierarchical scale. On the other hand, Carvalho, Eulina, Montané, & Pessoa (2012) state that in Iberoamerica strong efforts have been made to help women succeed. However, they have been unsuccessful. In spite of this, changes in public and education policies in general have achieved favorable changes. Merma & Gavilán (2013) say that in Latin America the increase in the number of women teaching in higher education is yet to become significant. It is true that they have been able to strive in soft subjects, there is still a strong resistance towards STEM subjects; just as in engineering where they have been unable to significantly strive (Rubio, 2007). Just like in Asian countries such as China (Chao & Postiglione, 2017), India (Tilak & Mathew, 2017), Japan (Mochizuki, 2017) and Korea (Byun, 2017). In contrast, with the rest of the countries in the continent, Argentina shows a higher increase in women professors, even being able to exceed the number of men in the profession (Marquina & Fernández, 2008). There is the same phenomenon in Asia, in Indonesia. Where women professors exceed the number of men (Helmi, 2017). Another country that effectively applies this equality and is even regulated by federal and state laws in Australia. This is one of the main requirements for academic promotion (Hayden, 2017). That is why (Duran Rodríguez, 2017; Gutiérrez et al., 2020), agree on the fact that in order to be able to achieve an adequate gender transversality in higher education institutions, it is necessary to have significant changes both in politics and in society. Equal opportunities between professors have to be generated so that there will be real changes in the insertion of women in high level positions. There is still an evident disparity in job positions in higher education institutions in Mexico, but most importantly, is the lack of accessibility present in those with a higher hierarchy. In addition to this, there is also an evident gap regarding those areas considered for "men", as well as those related to STEM, where there is a lack of acceptable positioning of women participation (Miranda, 2007; Garay & Valle, 2012; Cerva, 2018).

In a national context, as well as in the rest of Latin America, teaching and research are resources that are not equally distributed between the schedules and activities of the professors, since there is the demand to be greatly dedicated to teaching but not so much in researching. As opposed to other countries in Asia and Europe, where a great importance is given to research (Teichler & Proasi, 2021). Mexico has tried to find the way to promote that the teachers obtain higher academic degrees in their profession. That is why a great number of them have master's and doctoral degrees. This in addition to participating in the National Researchers System (SNI) (Amado Moreno et al., 2013). Both new professors as well as those with more experience mentioned feeling a high level of commitment with their performance and participation in teaching, even though those who are part of the SNI stated that they felt more committed with researching (Estévez et al., 2020) claim that teachers agree that conditions are not

the best, and that there is the need for more resources to be able to carry out their activities. At the same time, there is a higher participation of females, but the number of men in this type of activities is still proportionally higher (Galaz et al., 2012). On the other hand, women said that they had more difficulties to be able to belong to the SNI, which favors men, in spite of the fact that with time they have been granted more accessibility (Gutiérrez et al., 2020). Public policies have developed different support programs among which we have those providing financial support to professors. This program rewards professors who have done a good job. However, it is important to mention that women represent an evident minority (Galaz & Gil-Antón, 2013). Hence, the objective for this descriptive study is analyzing gender variables and STEM within the APIKS survey from the perspective of Mexican university professors.

2. Method

The method used for this research is a descriptive and comparative study with a qualitative focus since only an analysis of the obtained data is done, thus seeking to describe the generality of the information received, mainly that which will provide notable information on the representativity of the female gender in the country and the different institutions. This, in addition to the perception in the work environment, their STEM participation, and their preferences between research and teaching in contrast with the male gender. We explored the APIKS survey database. This survey was conducted in 30 different countries; however, we will be using national results. We took into consideration the results from 3776 professors who answered the survey. They represented a representative sample of five types of Higher Education Institutions: public research centers, federal public institutions, state public institutions, technological public institutions; and finally, private institutions. We considered as study subjects all those professors who participated in the survey. We focused on the analysis of the number of women participating in Science, Technology, Engineering, and Mathematics (STEM), in the institutions working in academic performance, in productivity, preference between teaching and researching for those conducting those activities. The selection and sampling procedure was independent in each of the participating countries. So, in Mexico when selecting the participating professors, they received a survey in their email accounts through an invitation and the following link attached: http://www.mie.uson.mx/encuesta. This survey had 138 items addressing issues related to academic career and professional situation, labor conditions and activities, teaching, researching, outreach activities, governance, and management, in addition to personal background. These results provide a general perspective regarding the participation of women in the academic profession compared to all the different institutions in the Higher Education System in Mexico. This analysis was only conducted with descriptive statistics measures (Hernández et al., 2014). We used SPSS software to process this data.

3. Sample

The sample was composed by five different higher education institutions integrated by: public research centers (27), federal public institutions (6), state public institutions (34), technological public institutions (46); and finally, private institutions (14). We had the participation of 127 institutions from a total of 139 selected from the APIKS database. The response rate from Full Time Professors (FTP), is of 3776, which represents a proportion of 5.91 percent of the answers from the total universe of 63,800 professors in Mexico (Estévez et al., 2020).

4. Results

In conclusion, the experience obtained in the application of the sample was through an electronic media which provided the opportunity to obtain the data from the different institutions. Therefore, it will be necessary in the future to expand our samples to the different higher education institutions in Mexico.

The results obtained from the information described in each one of the tables from one to six, where we describe the variables of gender, preference between teaching and researching, degree of professional and work satisfaction. Table 1 describes the percentage of genders: Women (56%) and Men (50%) out of a total of 1986 professors from State Public Institutions which represents a higher participation in the study in Mexico. The participating institutions were as follows: 1) Higher education centers dedicated to research and teaching of postgraduate studies; 2) Federal public universities focusing on providing bachelor's and postgraduate programs, research and culture promotion; 3) State public universities, also focusing on providing bachelor's and postgraduate programs, research and culture promotion; 4) Technological institutes, with bachelor's degree programs mainly and in a lesser degree with postgraduate and research programs; and 5) Private universities, with teaching as the main activity and some research.

Table 2 represents the gender in Science, Technology, Engineering, and Mathematics (STEM) of men (33%) and women (28%), out of a total 3776 participants from the different higher education institutions.

Table 3 contains the participation information about the preference between teaching and research of the professors belonging to STEM by gender: men (59%) and women (61%) out of a total of 3748 participants who have a higher preference in both, but leaning more towards research.

Table 4 represents gender participation in STEM of men (36%) and women (37%) out of a total of 3776. This reflects a high level of general professional satisfaction currently in the performance of their activities in higher education institutions.

Table 5 shows the degree of labor satisfaction by gender and STEM, where there is a very high level of satisfaction in the responses from men (44%) and women (42%) in their current working contractual conditions, salaries, and their

STEM participation, from a total of 3776 participating professors.

Table 6 shows that the degree of labor satisfaction is very high per gender and STEM for men (40%) and women (36%), related to workloads and working environment of the professors in higher education institutions out of a total of 3776 participants.

5. Conclusion

The APIKS-based study conducted in Mexico was applied to professors, and represents a continuity with the 2 previous ones (Galaz & Gil-Antón, 2013), in studies of degrees of degrees of satisfaction related to teaching, research, outreach, and management, with national and international comparability.

Table 1. Gender distribution per institution type.

Type of Higher Education Institution	Gender				Total	
	Women	%	Men	%		%
Public Research Centers	46	3%	89	4%	135	4%
Federal Public Institutions	344	22%	652	29%	996	26%
State Public Institutions	852	56%	1134	50%	1986	53%
Technological Public Institutions	127	8%	209	9%	336	9%
Private Institutions	160	10%	163	7%	323	9%
Total	1529	100%	2247	100%	3776	100%

Source: Propietary.

Table 2. Gender and STEM representation of the professors.

		Gender				Total	
		Women	%	Men	%		%
STEM	No	1104	72%	1504	67%	2608	69%
	Yes	425	28%	743	33%	1168	31%
Total		1529	100%	2247	100%	3776	100%

Source: Propietary.

Table 3. Preference of the professors between teaching and researching.

Preference	STEM		Total	Gender		Total
	No	Yes		Women	Men	
Teaching	5%	1%	145	4%	4%	145
Both, but more teaching	39%	8%	1110	31%	29%	1110
Both, but more research	51%	80%	2244	61%	59%	2245
Research	4%	12%	248	5%	8%	248
Total	100%	100%	3747	100%	100%	3748

Source: Propietary.

Table 4. Degree of satisfaction per gender and STEM of professors.

Current General Professional Environment	Gender		Total	STEM		Total
	Women	Men		No	Yes	
Very Low	5%	6%	202	6%	4%	203
Low	8%	5%	227	6%	6%	227
Regular	18%	17%	658	17%	19%	658
High	37%	36%	1375	36%	37%	1375
Very High	32%	37%	1313	35%	35%	1313
Total	100%	100%	3775	100%	100%	3776

Source: Propietary.

Table 5. Degree of labor satisfaction (the state of their contract, salary) per gender and STEM.

Their current working conditions	Gender		Total	STEM		Total
	Women	Men		No	Yes	
Very Low	6%	6%	211	6%	4%	210
Low	7%	5%	212	6%	4%	213
Regular	15%	12%	500	13%	13%	500
High	31%	34%	1232	33%	32%	1232
Very High	42%	44%	1621	41%	47%	1621
Total	100%	100%	3776	100%	100%	3776

Source: Propietary.

Table 6. Degree of labor satisfaction (workloads, work environment) per gender and STEM.

Their current working conditions	Gender		Total	STEM		Total
	Women	Men		No	Yes	
Very Low	5%	5%	182	6%	3%	182
Low	7%	6%	252	6%	7%	251
Regular	17%	14%	572	15%	15%	573
High	34%	35%	1314	35%	35%	1314
Very High	36%	40%	1456	38%	40%	1456
Total	100%	100%	3776	100%	100%	3776

Source: Propietary.

Regarding gender participation, men have a higher representativity in Science, Technology, Engineering, and Mathematics (STEM), in spite of the increase of interest of women in the last couple of decades in higher education institutions in Mexico.

When referring to the degree of satisfaction in professors, they have a prefe-

rence for teaching and research activities, and a high satisfaction in the professional and working environment in their institutions. This represents a continuity of the studies conducted in the article by Galaz & Gil-Antón (2013). However, it is necessary to continue exploring other comparability categories of these three studies in Mexico.

This study applied to professors in Mexico has shown an evolution in the participation of women in science and technology, particularly in hard science disciplines pertaining to STEM.

The impact of this research originated evidence from the perspective of the participants related to their positions regarding gender perspective within the participation in Science, Technology, Engineering, and Mathematics in academics in Mexico. This effectively indicates the reality of teachers and academic staff in institutions, particularly the participation of the women who work there. This indicates that there has been an important development in the participation of women in areas of knowledge such as science and technology, natural exact sciences, health sciences, and agricultural sciences. Nowadays, they are able to be positioned as those with higher impact, therefore with higher effects in higher education institutions; since their application is related to global growth and development. Therefore, women play a key role since without them, we would be unable to compete with other countries, and would be unable to become a first world country.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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