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SCIENCE AND TECHNOLOGY SINCE THE GENDER PERSPECTIVE

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Abstract

In this century, the scientific and technological development has brought a big impact in different spheres of society like health, economics, and many others fields. Some studies discuss the relationship between scientific and technological development and the country's richness, but one thing is true; its impact is unquestionable for social transformation.

The development of science and technology becomes strategic, so the World Bank indicates that science and technology will eliminate the poverty, this is a real concern because there are large differences in rich and poor countries. Although science and technology is not a panacea to eradicate poverty, surely it will help to eliminate these differences.

The development and scientific-technological appropriation, not the same in all countries and it is not the same as to the participation of men and women, which calls us to reflect about the causes of variability and its consequences. This is the reason that gender studies are very interested in the inclusion of women in the fields in which they had been excluded, such as in science. Noticing that the inclusion of women in the the traditional system scientific positioned as not equal to men, we found it necessary to question since scientific epistemology feminist.

Feminist research is a particular way of knowing and producing knowledge, their main interest is to eliminate gender inequalities which mark the relations of power between women and men and access to the centers and positions of power to help eradicate gender inequality, which is to undertake research "from", "with" and "for" women (Castañeda, 2008).

This paper will present some of the results of the participation of women in the field of science, particularly to make a comparison of women's participation in the world and as that participation is related to scientific educational levels. These results are part of a wider investigation that is being done at the National Polytechnic Institute (Mexico) with a gender perspective in order to identify the participation of women in the scientific-technology field.

Keywords: Gender studies, science and technology, education.

1 INTRODUCTION

The scientific and technological advancement of the countries is a very important element in the current economic models, as reflected in rates of innovation, patents boost industrial production, technological independence, among other things, all with social impact.

For this reason, many countries and global institutions have been given the task of finding indicators that measure the progress of this scientific and technological activity. Since 1930 in the Soviet Union attempted to measure this progress with some statistics, in 1940 the United States made attempts to measure research and experimental development (R & D), 1950 National Science Foundation (NSF) in the U.S., decided to send U.S. companies a regularly survey to collect statistical data. But years later they found that the data collected at the country level, it was impossible to make international comparisons. Therefore appear on stage international organizations interested in the subject, like Organization for Economic Cooperation and Development (OECD), formed by 25 countries) and, Statistical Office of the European Communities (Eurostat) of the European Commission, formed by 15 countries). [1]

With this international vision appears 'OECD' proposal in 1963. It was a first manual containing basic definitions and categories of research and development activities, manual developed by experts in statistics research and development (R & D) who met in work session at the Villa Falconieri in Frascati, Italy. The name of this manual was Proposed Standard Practice for Surveys on Research and Experimental Development, but is known as "Frascati Manual". This document has been perfected, in 2002, came the sixth version, is currently used in many countries as it provides

internationally accepted definitions, classifications of activities and obtaining standard surveys to conduct research that may arise analysis of national research systems and development and promote development policies.

Currently there are guidelines documents, result from international efforts under the coordination of international organizations, as is the case of the Oslo Manual, (its third version is from 2005), this document is a guide for obtaining and interpreting data innovation. Other documents are Canberra Technology Manual (human resources in Science and Technology), Balance of Payments Technology Manual, Patent Manual, Bogota Manual (this is the handbook of Latin American Technological Innovation Indicators), among others. [2]

The analysis of these indicators can provide guidance in the elaboration of policies for science, technology, this locally, nationally and internationally.

For this reason, United Nations Educational, Scientific and Cultural Organization (UNESCO) promotes activities and programs that support the development of science and technology, for example, the UNESCO World Conference 1999, this prompted the commitment of governments, scientific communities between others, to ensure full participation of girls and women in the field of science and technology, to do so seeks to promote research in science and technology since a gender perspective. UNESCO considers important to encourage: 1) an increase in the participation of women in careers in science and technology and research and development (R & D) in the world, 2) increased public awareness on issues of science, technology and Gender, and 3) increase the collecting of more data on science, technology and gender and promote rigorous research to determine the "state of the science". [3]

Statistical indicators of science and technology should also be disaggregated by sex, especially in a vision of gender. Studies such as the Long & Fox, (1995) [4] and Russell (2003) [5], consider that women live science inequalities compared with male participation in the field of scientific productivity, acknowledgment. Sometimes this difference is attributed to the number of women graduating from higher education and the number of women scientists in the field of research. However, other studies (Stack, 2002), believe that with the increasing number of women by profession, increase the number of women about their scientific production in that field, such as that observed in the case of sociology where participation of women is higher than men's, and therefore have largest scientific productivity and higher recognition. [6]

2 GENDER PERSPECTIVE

Gender perspective has antecedent in the social political movement called Feminism. This begins at the end of century eighteenth and early nineteenth centuries. Women (mostly women but also men) requesting equal to men in terms of educational opportunities, work and also denounced the causes of gender oppression. This movement was eventually winning battles, was also reconfiguring its objectives. That is why one of the most famous stages of feminism was about the middle of twentieth century (60s and 70s) where requested equal conditions for the exercise of rights of sexuality, family, work, equal pay, equal days labor.

Up to the present time it is not considered that the feminist movement has won every battle, because in principle also seen cultural inertia which is part woman and sometimes many of the unequal treatment are promoted by the same culture of women.

Faced with this situation a number of trends are to foster a culture of equity, and looking at its root transformation that is socio-cultural. It's when will note a change of the name of feminist studies to gender studies in accordance with the word sex, "feminine" / "masculine" is taken as that which refers to the biological characteristics. By contrast, the word "gender" is a social construction from the cultural expectations of the roles that a person should follow mainly from sex. In addition to gender studies, referred to a more inclusive perspective, it cannot be studied only women but also men studied (not exclusively biological beings but from the social sphere).

Precisely is for this trend of gender studies is not considered that the genetic predisposition (sex - biological characteristics) explain as natural female subordination, pursuant to the rules, behaviors, attitudes, etc., is part of social learning.

It is in the 70's when the United Nations (UN) takes more force to promote gender equality in particular clearly observable disparity between the opportunities for education, employment and participation of women in society. Result of these trends, the world was held the International Year of Women in 1975.

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In the so-called "United Nations Decade for Women: Equality, Development and Peace" (1976-1985), was given special importance to the role of women in science and technology, since creating various promotional strategies under the project named "Science, technology and gender."

From this perspective involves the study of the participation of women in science, First, descriptive statistics that allow us to see the difference or not the participation between men and women in science from different countries. Then in other stage of the research, we will analyze the participation of men and women in Mexico and specifically identify the policy conditions that generated the Science-Technology and Gender and especially at the National Polytechnic Institute

2.1 Gender and Science International Context

The development of science and technology becomes very important field up to now. For example for the World Bank: science and technology will eliminate poverty, real concern to the extent of the big differences between countries in terms of wealth creation. Jorge Nuñez indicates: By 1960 20% of the world population in the richest countries was thirty times more income than the poorest (20%), and by 1997, seventy-four times.

Let us see global numbers on participation of researchers in different countries:

Fig. 1: Researchers (M and F) in the various countries in the period 2007-2011



Source: World Bank Working for a world without poverty. Researchers in R & D (per million people). [7]

The UNESCO document "Science Technology and Gender, International Report", (2007), is taken as an urgent priority: To this end, innovation networks that identify S&T priorities are expanding beyond industry and research institutions to include a larger range of technology users, grassroots organizations, science and engineering organizations, and other members of civil society. Moreover, initiatives to educate the public on S&T issues (popularization) and to promote scientific literacy in schools and in non-formal education are also increasing throughout the world. S&T education with a gender perspective is becoming a central component of education at all levels. [8]

3 METHODOLOGY AND RESULTS

In this first stage of research, documentary research use, recovery statistics in official documents or requesting this information on the institutions.

First to all, it was essential to identify whether the participation of men and women in science and technology in different countries is similar. For this there are various studies.

As shown in Fig. 2 for 2005, the participation of women in science is different in different areas of the world.

Figure 2: Women as a share of the total number of researchers (headcount), 2005



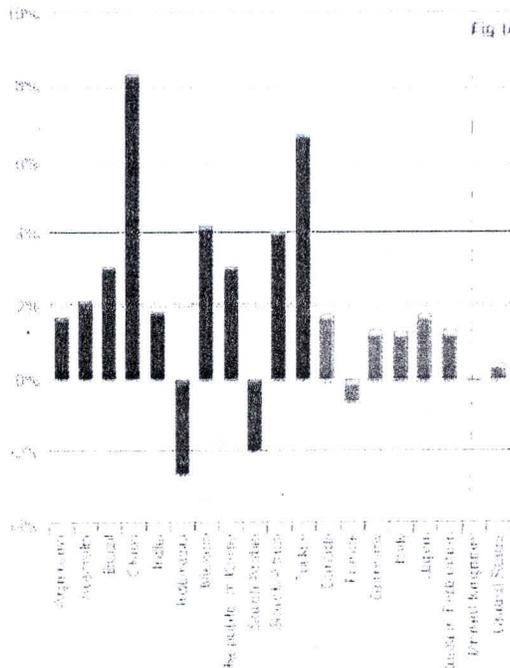
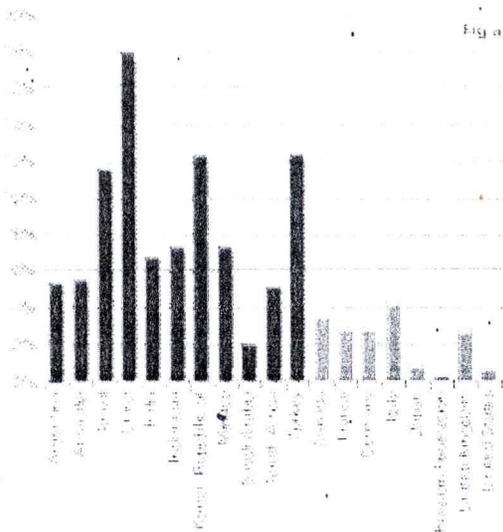
Source: UNESCO Institute for Statistics, (UIS), March 2007, cited in [8]

One explanation that is provided to explain the difference of advances in science and technological field between countries refers to investment, primarily through the indicator of gross domestic product. Fig. 3 (world) , but the GDP is not the only factor for this development.

Fig. 3 Science in the G20

Fig. 3a. Annual Growth in publication 1996-2008,

Fig 3b Annual growth in GDP spending on R&D 1996-2007

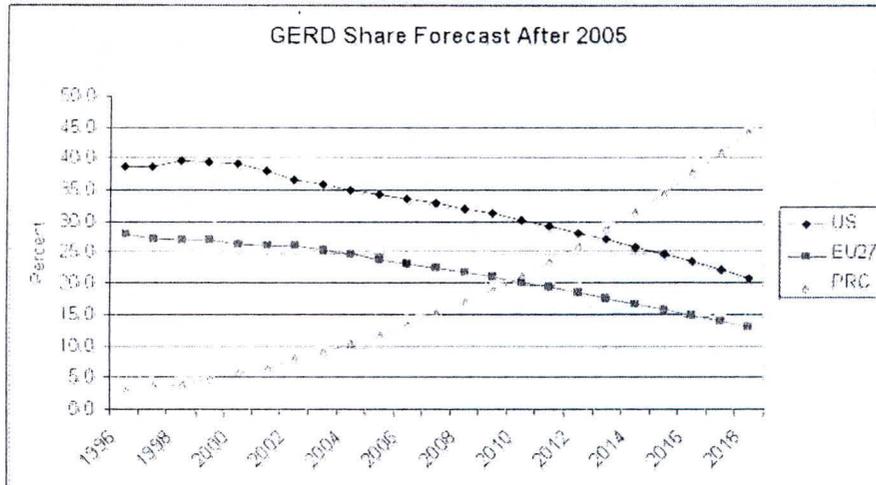


Source: Smith, C., & Sotala, K. (2011). [9]

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Complementarily, it presents the observed data with respect to GDP in Europe. Fig. 4 shows the GERD share obtained by dividing a nation's GERD by the OECD Group Total. Here it is predicted that China will pass the US in GERD, and GERD share, by 2013 to lead the world in R&D investment. See Fig. 4.

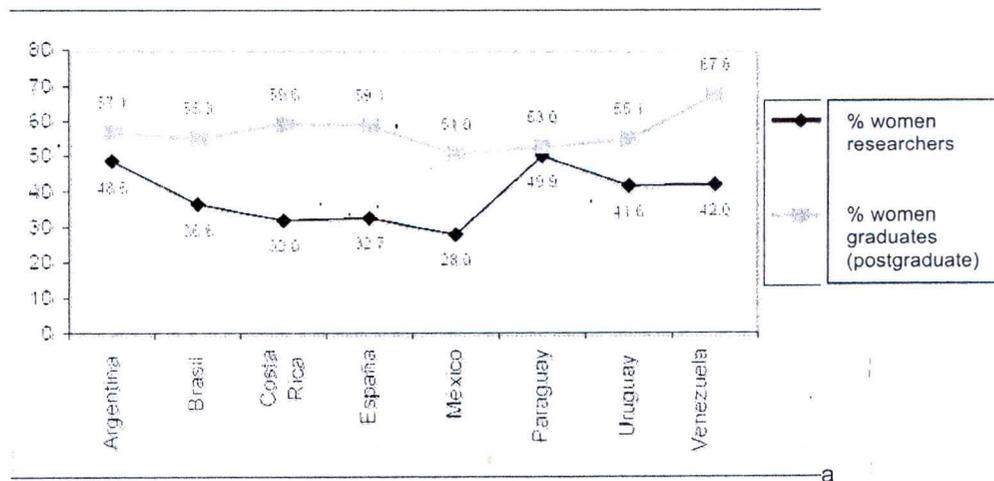
Fig. 4 Forecast of national R & D investments shares. GERD Share of OECD Group in percent (Historical data trough 2005.)



Source: Shelton & Folland [10]

But if the economic factor is important but not determinant for the scientific and technological development, then now consider the educational level of the personnel engaged in the field of research. In this case and are gender-disaggregated statistics (Fig. 5).

Fig. 5 Comparison of female participation among graduates of degree (all disciplines) and among researchers in the science and technology national system (regional level: Latin America)

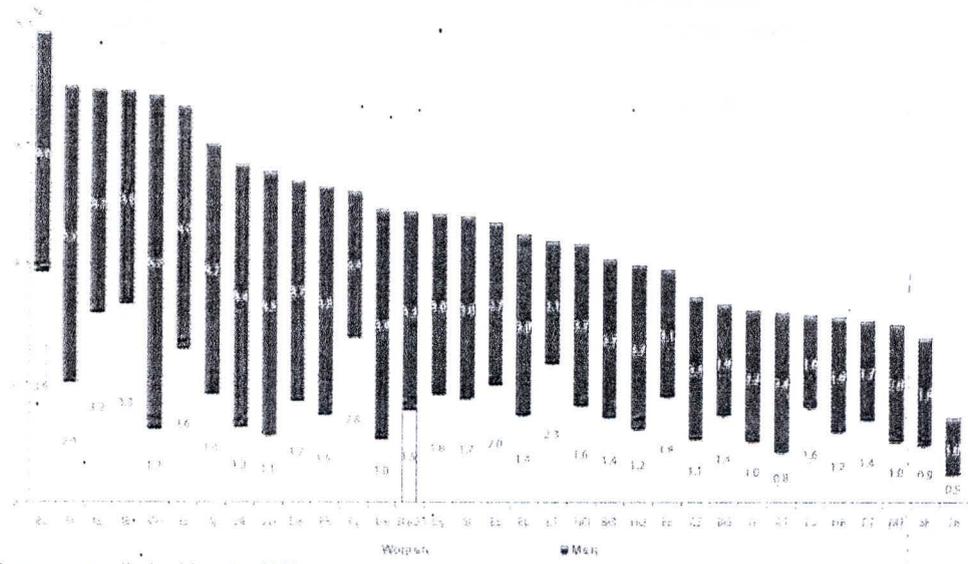


Source: UNESCO-SAP [11]

But it also found that while women may have a graduate level, this does not necessarily mean that they wish to do research and / or scientific development or that while they perform these activities, does not mean that they always get the formal acceptance of the research systems of their own country. See Fig. 6.

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Fig. 6 Breakdown of scientists and engineers (S&E) AGED 25-64 years by sex, as a percentage of the total labour force. EU-27 and selected countries- 2007



Source: Eurostat statistical books [12]

Figure 6 presents the percentage of scientists and engineers in the labour force and also adds their gender distribution. The highest proportion of scientists and engineers was found in Belgium. In Slovakia and Turkey, this proportion fell to under 3 % of the labour force. In most of the countries under review, scientists and engineers were more likely to be male than female. Notable case were Poland and Lithuania, where scientists and engineers were more likely to be female

But women working in science are still significantly underrepresented, despite the fact that the number of European

4 CONCLUSIONS

To solve national and regional problems, require the participation of people trained in the field of research, development and innovation, men and women. For this, there are policies that seek to promote this field. However, there are many differences between the central countries, the peripheral countries, the amount of economic investment, government support, participation of men and women.

We have observed in our research, that the institutions of power and spheres of action in the field of science and technology are still heavily dominated by men. Can be observed some evidence related to a better positioning of women scientists in some areas and even countries, this means the importance of culture, over the biological factor.

In our study, both at the international, national and institutional level, we agree with UNESCO when it states that UNESCO has recommended collecting data on R&D personnel disaggregated by sex from as early as 1978, however, the lack of statistics on STG has been reinforced by the lack of attention paid to gender in the more widely used OECD Frascati Manual. Recognizing the lack of sex-breakdown in R&D statistics from Eurostat and OECD, in 2001 the European Commission created a sub-group of 'Statistical Correspondents' within the Helsinki Group on Women and Science to collect sex-disaggregated data and to develop gender-sensitive S&T indicators. These policies must be implemented even in every level.

It has a very broad overview of science and technology in the world, international organizations have been an important part of their study and their momentum, however, it is important to make comparisons to know where we are and from a local study, to propose implementation. Otherwise it, will not work.

Our vision is not based on statistics just increasing the partition of women in science, the importance of this study is that the women involved in solving national and regional problems, permit incorporating their perspective of the situation, their perspective of the problem, its resolution perspective of, especially when the problems are related to social impact, and / or technological appropriation. It does not mean that men fail to do so but between both views enrich the scene. This is the importance.

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