

Women, Education and Science

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SUMMARY

The study presented discusses the insertion of women in the sciences and starts from the assumption that Western epistemology is based on the dualism that is hierarchical, since it privileges mind or reason, said to be proper to masculinity, to the detriment of prejudice against the body and matter, which represents femininity. The objective is to analyze gender relations, whose differences have deepened social and, in particular, educational inequality, especially in relation to the insertion of women in the sciences. To fulfill the proposed objective, the methodology used will be the combination of analysis-synthesis and historical-logic methods, conceived in its dialectic unit. Research techniques such as bibliographic and documentary were used, through data provided by international organizations, censuses and national research institutes. The study of this theme is justified for considering it relevant in the current context where much is discussed from the perspective of building a plural society, with gender justice and less inequality. It is worth mentioning that the study proposed here was presented at the meeting of ANPEd - North, in 2016, at the Federal University of Pará. Thus, it is understandable that education for gender relations has been a relevant theme regarding practices oriented to the discussion of prejudice and discrimination against women.

Keywords: Women. Gender. Education. Science.

INTRODUCTION

Education for gender relations, inscribed in the transversal perspective of the organization of pedagogical work, has been a relevant theme regarding practices oriented to the discussion of prejudice and discrimination against women.

Gender relations are imbricated in the trinomial, sociedade-culture-socialization, and move according to the dynamics and social transformations that operate there. Society is an indispensable component of human social life, the culture emerges as an expression of that life in the social context and, finally, socialization develops as learning the cultural patterns for life in society.

Thus, there is no human behavior outside of culture since it is a distinctive feature of human societies and collective life is made up of representations. It can be said that the logic that determines these social representations is based on a duality, which hierarchizes and defines social relations, making them unequal.

Societies are full of norms and values that are established in order to organize the social life of their members, making men and women have certain roles, assume certain functions, defining hierarchies. If, on the one hand, aspects perceived culturally as masculine are valued, on the other hand, those taken as feminine are dulled.

For women, in particular, the collection is even more rigorous, since a series of stereotypes is still launched that compete so that they, since their birth, find values that delimit their behavior, thus establishing which postures should be adopted. The various stereotypes about men and women can be observed: "aggressive, militaristic, rational for them; docile, relational, affective for them". (VIANNA, 2002, p.93).

These expressions mark social representations that are inscribed in the bodies that carry the mark of their time. A time inscribed either under religious ideology, whose dominant power was present in the Church, or under scientific ideology, whose power is still present in the Modern State. The focus of the dominant institution is changed in a determined historical moment; however, not much is changed in terms of the power relations that are established in each highlighted period. In other words, unlike the ideological focus present in each historical moment, there are aspects that still remain, and here the issue of the social condition of women is highlighted, although resistance has been a constant presence in these power relations.

This social condition is implied, among other aspects, in their devaluation as human beings endowed with intelligence and practical knowledge, which has always been a strong weapon of men, holders of privileges, who sought ideological mechanisms, based sometimes on religion, as in the period of the Middle Ages, sometimes on science, as in the period of the Modern State, to silence their voices and social practices.

Physical reasons were sought to justify their alienation in the most different spaces other than the domestic (CLARKE apud MORENO, 1999). And by not reaching a direct rupture, like their insertion in formal education, other artifices were created, in an attempt to introject ideas that would make them believe that their abilities are more focused on certain areas of knowledge than others, like the exact sciences.

The image built for men and women at the end of the 19th century and the beginning of the 20th, attributed to these physical, psychological, intellectual and emotional characteristics that were superiorly differentiated. About women, it was said that "excessive education could harm their natural focus more on emotion than on intelligence skills. Destined for motherhood, they should be spared so as not to harm the health of their future children, and this included cognitive parsimony. (ALMEIDA, 2007, p.177).

The 18th century can be seen as a dividing line when it comes to women's social roles, because at the same time we have, in a period before it and up to its half, women with scientific knowledge, even if empirical, through chemical and pharmacological studies, for example, after this period, and with the consolidation of formal scientific knowledge, based on rationality and control, these women have been usurped from this knowledge and unable to access the newly constituted knowledge (TOSI, 1998).

The usurpation of these knowledges is associated with a series of factors, among them, the constitution of formal scientific knowledge, the consolidation of industrial capitalism, and the rise of the bourgeoisie. In relation to the former, there is a whole construction that brings the characteristics of this knowledge, as rational and objective, closer to men and excludes women because they are considered emotional and subjective. In relation to the last two, there is a significant change in values in relation to social roles and, in this particular, those attributed to women, since manpower was needed for insertion into the productive system and reproduction of the labor force.

It is not surprising that the access to formal education and the consequent professionalization of women, occurs, especially in the areas of care, like nursing, and teacher training, mainly directed to the initial grades of basic education.

The basis of Western epistemology, or in other words, the Western philosophical and scientific tradition, is based on the dualism that is hierarchical, since it privileges the mind or reason, that is, masculinity, to the detriment of prejudice against the body and matter, which represents femininity. This means that, at the time when it values one side, associated to the masculine, it lowers the other, associated to the feminine. Donna Wilshire exemplifies this issue by taking up a classic of philosophy:

Aristotle's world is characterized by polarized opposites in which one side has dominion over the other; for him, the Soul has dominion over the body, Reason over emotion, the Masculine over the feminine, and so on. The Pure Mind relates to the 'divine' Soul, which is superior to all earthly things. [...] surely the masculine Mind and Reason dominate and are 'more divine' than the feminine body, because the woman (being dominated by emotions and bodily functions) is not so capable of Mind and Reason, etc. (WILSHIRE, 1997, p.102-103).

This construction of the perception that men are more active and prone to the area of rational knowledge is introjected in such a way that, when a woman stands out, the direct association that is made is that she resembles a man and not that she is as capable as he is of developing skills in this area.

Women, however, along the history, have not accepted in a passive way these stereotypes. For centuries they have opposed the idea of natural inferiority and have argued that the differences in aptitude and capacity between men and women depend, in reality, on unequal access to education.

The discrimination in access to education that thinkers denounced took on a different dimension in the periods in which they each wrote. This discontent can be expressed in many ways. From literature, following the example of Cristhine de Pizan, when she wrote about the need for recognition of women as subjects, to the example of the work "The City of Women" at the beginning of the fifteenth century (SERRANO, 2006), to the "Preciosas" (GARCIA, 2011) in the seventeenth century, owners of French salons who fled from superficiality and discussed issues such as rational thinking, education and freedom.

It can also be expressed in the contested texts, of a political nature, such as that of Mary

Wollstonecraft of England on the Demand for Women's Rights of 1793 and of Olympe de Gouges of France, who wrote the "Universal Declaration of the Rights of Women and Citizens" in 1791, for not being represented in the "Universal Declaration of the Rights of Man and of the Citizen" of the same year written during the French Revolution. Or, for example, in the writings of the Brazilian Nísia Floresta who wrote in 1832 on the "Rights of Women and Injustice of Men.

Added to this are the women's movements for education, universal suffrage, equal employment opportunities, and legal rights within marriage, among others, which extended from the 19th to the 20th century, beginning the waves of feminist movements, whether liberal or socialist in nature.

The situation was different in the middle of the 19th century, because since the 18th century educational opportunities in the West were changing as a result of the progress of science, the capitalist development of production and the need for skilled labor for industry and services.

It was only at the end of the 19th century that women progressively acquired the right of access to universities. To this end, "they are asked to use their knowledge for altruistic and unselfish purposes. To please their husbands, to be better teachers to their children, but never for personal purposes". (BADINTER, 2003, p.68). This observation made by Badinter leads us to reflect on the unequal insertion of women in the different areas of knowledge, where the most inclined to women are those that involve care, both in the field of health and education.

The study of this topic is justified for considering it relevant in the current context where a lot is discussed in the perspective of building a plural society, with gender justice and less inequality, and school is a privileged space to develop practices oriented to overcome prejudice and gender discrimination.

2 METHODOLOGICAL PATH

Based on the foregoing, the objective of this article is to analyze the gender relations that reproduce in a historically determined society, whose differences have deepened social and, in particular, educational inequality, especially with regard to the insertion of women in the sciences.

For this purpose, the methodology used will be the combination of analysis-synthesis and historical-logical methods. Initially the analysis of the elements of the situation raised will be made, relating them among themselves allowing the synthesis that is produced based on the results obtained previously through the analysis. Two essential components developed in this process of analysis-synthesis will be historicity and logicity, conceived in its dialectic unit.

Research techniques such as bibliographic and documentary were used, through data provided by international organizations, censuses and national research institutes.

This theme has often been approached by education, however, the indicators show us that advances have occurred, but much remains to be done concerning school practices and changes in attitudes towards gender justice.

It is worth noting that the original text of this article was presented at the ANPED/Norte event in 2016, at the Federal University of Pará. After that, some reflections were made to improve the text.

3 WOMEN, EDUCATION AND SCIENCE

It is necessary to understand how these gender relations occur and reproduce in a historically determined society and, therefore, it seems appropriate to develop the study of these relations, based on the analysis of gender and habits, as durable provisions that reiterate behaviors, without making them permanent.

Differences such as race and sex have historically contributed to the deepening of social inequality of subjects inserted in these categories, such as blacks and women, thus concluding that gender and race inequalities are structuring for social inequality in Brazil. According to Nancy Fraser:

Gender, for example, has economic-political dimensions because it is a basic structural principle of political economy. On the one hand, gender structures the fundamental division between 'productive' paid work and 'reproductive' and unpaid domestic work, giving women primary responsibility for the latter. On the other hand, gender also structures the internal division of paid work between higher-paid professional and manufacturing occupations where men predominate, and low-paid 'pink collar' and domestic services occupations where women predominate. (FRASER, 2006, p.232-233).

To reinforce this issue Cláudia Vianna and Sandra Ridenti claim that in our society, inequalities between men and women are strongly attributed to sex distinctions, with evident biological connotations. Thus, sex refers to the physical differences between men and women, and these distinct characteristics are used by individuals in the construction of a "set of social and cultural representations, values and social attributions that we call gender, which in turn refers to an attempt to incorporate aspects that are socially constructed, noting that each culture defines what is male and female". (VIANNA; RIDENTI, 1998, p.96-97). Therefore, these are procedural and changeable definitions.

In this way, we start from the unnatural and non-essentialist character to analyze the relationships that are established between men and women in a given society. Therefore, nothing is more appropriate than referring to the concept of gender "developed to contest the naturalization of sexual difference in multiple arenas of struggle". (HARAWAY apud CARVALHO, 2011, p.101). In this sense, it gives us subsidies for a better understanding of the different and varied forms of interaction between human beings.

Thus, the optics is directed to a process, to "a construction, and not to something that existed a priori. The concept now demands that we think in a plural way, emphasizing that the projects and representations about women and men are diverse". (LOURO, 2012, p.27). For Joan Scott the concept of gender is "anchored in an integral connection between two propositions: it is a constitutive element of social relationships based on perceived differences between the sexes; and it is a primary way of giving meaning to power relationships". (SCOTT, 1995, p.86).

Based on the above, it is understood that there are objective structures in the social world, such as social institutions, the family, the church and the school, which can direct the action and representation of individuals. From this perspective, the school reproduces the power relations present in society, in addition to reiterating discourses full of prejudice and discrimination.

Prejudice is understood as "a negative attitude, unfavorable to a group or its individual

components. It is characterized by stereotyped beliefs" (SILVA apud CANDAU, 2003, p.16).

To better elucidate this concept, Edison Borges et al. state that:

Prejudices are part of our socialization process and it is extremely difficult to eradicate them from thinking, because the critical perspective requires more effort than the simple acceptance of false ideas, but which we are used to and which favor us. Furthermore, prejudices are rooted in all cultures, marking the relationships that each one establishes with the others and often justifying unequal treatment and discrimination of individuals and groups. (BORGES et al. apud CANDAU, 2003, p.17-18).

There is a close relationship between prejudice and discrimination, while the first refers to attitude, the second to concrete social practices, meaning,

[...] the unfavorable treatment usually given to certain categories of people and/or groups. It refers to social control processes that serve to maintain the social distance between certain groups, through a set of more or less institutionalized practices that favor the arbitrary attribution of traits of inferiority for reasons, in general, independent of the actual behavior of the people who are the object of discrimination. (CANDAU, 2003, p.18).

This is maintained because societies are full of norms and values that aim at the adjustment of individuals and, consequently, the maintenance of the current societal model. For women, above all, all these values are much more rigorous, because stereotypes are still launched that compete so that they, from their birth, find values that delimit their behavior, thus establishing the postures they should adopt.

Being specifically about the school institution, according to Fúlvia Rosemberg et al. the feminine and masculine values present in these spaces can be used for the propagation of stereotypes, as well as to interfere in the production and reproduction of gender prejudices, since this kind of prejudice - which affects boys and girls in classrooms or school space - is based on an educational system that reproduces the structures of power, of privileges of one sex over the other in our society and even appears in textbooks and school relations. (ROSEMBERG et al. apud VIANNA; RIDENTI, 1998, p.100).

This implies that formal education reflects the values culturally developed by the society in which it is inserted, passed on through socio-educational conceptions present at a given historical moment, as well as the school curriculum, teaching contents and shared knowledge.

According to Vera Candau (2003), the educational institution is the stage for manifestations of prejudice and discrimination of various kinds. However, school culture tends not to recognize them, since it is impregnated by a standardized representation of equality. The author comments on this:

The school, in most cases, deals badly with differences and tends to silence and neutralize them. Prejudices and different forms of discrimination are present in school daily life and need to be problematized, unveiled, denatured; otherwise, the school will be at the service of reproducing standards of conduct that reinforce the processes of discrimination underway in society. (CANDAU, 2003, p.92).

This reproduction of patterns of conduct still tends to determine careers that are sexualized, hierarchizing them and valuing them in different ways. The result of this is the insertion of women in productive activities of a relational, affective and caring nature, often moving away from those that require logical reasoning and greater power of abstraction, conceiving this issue as natural and not as a social and

historical construction.

When observing the data from the Higher Education Census (2010, 2013), for example, the courses with the highest percentage of female students are Social Service, Speech Therapy, Nutrition, Secretariat. In this sense, the reproduction of the sexualization of careers is a fact that is observed when we analyze the distribution of enrollment in higher education by sex and course.

Even the dominant positions in which women occupy an increasing number, in Pierre Bourdieu's evaluation, are essentially in the dominated regions of the area of power, i.e., in the production and circulation of symbolic goods such as publishing, journalism, teaching. (BOURDIEU, 2011, p.111). The teaching function, for example, particularly in the initial grades of basic education in several countries, is made up significantly of women, when such an activity is conceived as an extension of that carried out in the domestic space with regard to the care of the offspring.

Women currently study harder and are financially responsible for an increasing number of homes. Nevertheless, the country's research institutes prove that they still occupy fewer formal jobs than men and have lower salaries, even when they perform the same function, that is, they have conquered more space, but still haven't managed to overcome the inequalities regarding salaries and positions.

For Pierre Bourdieu, all knowledge rests on a fundamental division operation, that is, the opposition between the feminine and the masculine. The way people learn this division is through the daily activities imbued with symbolic meaning, that is, through practice. The quotidian concepts about the feminine and the masculine structure the perception and the concrete and symbolic organization of the whole social life. (BOURDIEU apud LAMAS, 2000, p.18).

These quotidian concepts polarize the feminine and the masculine, establishing distinct patterns of behavior that are reiterated by the social institutions, as the family and the school, that is, since the primary socialization; reaching, in the youth or in the adult phase, the choice of the profession to be followed.

In this way, there is a whole discourse of representation of the feminine that brings an affinity for the social area and care, for example, whose justification is in the characteristics closest to affectivity, sentimentalism, emotion. The interest in science and technology, on the other hand, has always been viewed with mistrust when it comes to women's skills and abilities for the most rational and abstract field, placed as characteristics more proper to men. The female cognitive parsimony was used as one of the reasons that led to the absence of women from these areas.

Thus, there are models that reproduce traditional and conservative patterns, which tend to direct men and women to certain professions that carry within themselves social representations of the male and female.

Moreover, in the classroom, there is a whole discourse of reiteration of skills and abilities differentiated for both sexes, with a male inclination to disciplines that require logical reasoning, precision, technique, that is, the so-called hard sciences. On the other hand, there is a feminine inclination towards those more relational, focused on the humanities. This has a decisive effect when, in the final stage of basic education, young people need to define which profession they will follow, at a technical level or in higher education, in a technological course, bachelor's degree or diploma.

This definition of the profession brings with it a load of social meanings that tend to determine

the career paths of men and women. For them, male careers that presuppose greater power of abstraction, logical reasoning. For them, women's careers, focused on the care of others and the humanization of social relations.

These issues are problematized, starting from the unnatural and non-essentialist character of being in the world, and education for gender relations has become a relevant issue in terms of practices oriented to the discussion of prejudice and discrimination against women.

Since the 1990s, Brazil has been undergoing educational reform processes, whose normative documents have addressed gender issues from the perspective of overcoming prejudice and discrimination against women, following the example of National Curriculum Parameters.

The 1990 World Declaration on Education for All, which addressed the satisfaction of basic learning needs, states in its Article 3: "Universalize access to education and promote equity, guaranteeing access to education for girls and women, and overcome all obstacles that prevent their active participation in the educational process. Prejudices and stereotypes of any nature must be eliminated from education". (UNESCO, 1990).

Since then, the discussion on the new directions of education and the exclusion of minorities, like prejudice and gender discrimination, has been one of the problems that are necessary for reflection and implementation of policies aimed at overcoming them. In this regard, it is worth mentioning that the UN held five international conferences in the 1990s on issues related to women, development and education.

There is a whole discourse of the Brazilian State focused on gender equality, considered as transversal in federal policy planning. In this direction, the National Plans on Policies for Women, linked to the Special Secretariat on Policies for Women, reaffirm the above.

In addition to these projects, there is also the Women and Science Program, created in 2005, whose objective is "to valorize the field of studies on gender, women and feminism relations, and promote reflection on gender relations among high school students, undergraduate students and graduates through the Building Gender Equality Award. (Women and Science Program, 2005).

As far as the object of analysis of this article is concerned, the path is long and permeated by prejudice and discrimination, which leads to unequal access, permanence and recognition of women in the scientific field.

According to Maria del Pilar Sancho (2006, p. 129), statistics of Nobel Prize winners show that physical women appear in an unfavorable position in relation to chemical or medical women. According to a survey she made in the early 2000s, of the 174 Physics winners, only two were women: Marie Curie in 1903 and Maria Goeppert-Mayer in 1963. Of the 146 Chemistry winners, three were for women: Marie Curie in 1911, Irene Joliot-Curie in 1935 and Dorothy Crowfoot Hoodgkin in 1964. Of the 182 medalists, seven were women: Getty Cory in 1947, Rosalyn Yalow in 1977, Barbara Mcklington in 1983, Rita Levy Montachini in 1986, Gertrude Elion in 1988, Christiane Nüsslein-Volhard in 1995 and Linda B. Buck in 2004.

The representation of women until 2011 was 5.2%, which is the most representative area, in the decreasing area of nomination, we have the Nobel Peace Prize, Literature and Medicine. In the case of the Nobel Prize in Physics, beyond the two women mentioned in the previous paragraph, we had two more, one in 2018 and one in 2020, that is, four in total, since the creation of this prize in 1901. In the case of

the Nobel Prize in Chemistry, in addition to the three women mentioned in the previous paragraph, we had four more, one in 2009, one in 2018 and two in 2020, that is, seven in total.

4 FINAL CONSIDERATIONS

The analysis presented here has made us reflect on the insertion of women in the sciences and is based on the assumption that Western epistemology or Western scientific tradition is based on the dualism that is hierarchical, since it privileges mind or reason, said to be proper to masculinity, to the detriment of prejudice against the body and matter, which represents femininity.

Women, however, throughout history, have not passively accepted these stereotypes. For centuries they have opposed the idea of natural inferiority and maintain that the differences in aptitude and capacity between men and women depend, in reality, on unequal access to education. An education that must be understood as an important instrument that influences personal and professional training, that is, the full development of people.

However, this broader dimension placed on education is far from being realized, and what is observed is that it acts as a reproducer of gender relations, since it reflects pre-established cultural patterns, leading to differentiated education and the consequent sexualization of careers.

The lack of gender equality in the academic, scientific and technological fields is not a particularity of science. It is in consonance with the lack of equality between women and men in other spheres of social life. However, when observing a certain area, such as engineering, and according to the data presented, the inequality is even greater, because there is a whole socio-cultural construction that distances women from this field.

Although cultural barriers have been broken down and women have been included in careers historically considered male, subtle and complex processes of prejudice and discrimination persist. In addition to breaking down barriers and breaking down careers, world consciousness becomes essential for building new relationships based on social justice, respect and human dignity.

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