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Gender violence as a topic in science education: a proposal for continuing education for elementary school teachers[1]

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ABSTRACT

The "School Week to Combat Violence against Women" included themes related to gender-based violence in Basic Education curriculum. The objective of this research was to analyze a proposal for continuing teacher education to develop pedagogical activities that included discussion on gender. Six Science teachers from the final years of Elementary School participated and the data analyzed by Discursive Textual Analysis resulted in three categories: 1. "Gender, violence and Science teaching", 2. "Visibility of women scientists" and 3. "Teacher training". The results indicated that the training course provided an environment for discussion on gender in different spaces, as well as favored development of pedagogical proposals that involved inclusion of the theme of women scientists and the several forms of violence experienced by women in different spaces, including the academic one. The importance of spaces for information and reflection on representation and diversity was demonstrated.

KEYWORDS: Teacher Education; Elementary School; Science Education; Women scientists.

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Violência de gênero como tema na educação em Ciências: uma proposta de formação continuada para docentes do ensino fundamental

RESUMO

A "Semana Escolar de Combate à Violência contra a Mulher" inseriu nos currículos da Educação Básica temas relacionados à violência de gênero. O objetivo desta pesquisa foi analisar uma proposta de formação continuada para a elaboração de atividades pedagógicas que inserissem a discussão sobre gênero. Participaram seis docentes de Ciências dos anos finais do Ensino Fundamental. Os dados analisados pela Análise Textual Discursiva resultaram em três categorias: 1. "Gênero, violência e ensino de Ciências"; 2. "Visibilidade de mulheres cientistas"; e, 3. "Formação docente". Os resultados indicaram que o curso de formação proporcionou um ambiente para a discussão sobre gênero em diferentes espaços, assim como favoreceu a elaboração de propostas pedagógicas envolvendo a inserção da temática mulheres cientistas. Ainda, como as diversas formas de violência vividas por mulheres em diferentes espaços, entre eles, o acadêmico. Assim, demonstrou-se a importância de espaços para informação e reflexão sobre a representatividade e diversidade.

PALAVRAS-CHAVE: Formação de professores; Ensino Fundamental; Ensino de Ciências; Mulheres cientistas.

La violencia de género como tema en la enseñanza de las ciencias: una propuesta de formación continua para docentes de educación

RESUMEN

La "Semana Escolar de Lucha contra la Violencia contra las Mujeres" incluyó temas relacionados con la violencia de género en los planes de estudios de Educación Básica. El objetivo de esta investigación fue analizar una propuesta de formación continua docente para el desarrollo de actividades pedagógicas que incluyeran la discusión sobre género. Participaron seis docentes de Ciencias de los últimos años de Educación Primaria y los datos analizados mediante Análisis Textual Discursivo resultaron en tres categorías: 1. "Género, violencia y enseñanza de las

Ciencias", 2. "Visibilidad de las mujeres científicas" y 3. "Formación docente". Los resultados indicaron que la capacitación brindó un ambiente de discusión sobre género y favoreció el desarrollo de propuestas pedagógicas que incluyeron el tema de las mujeres científicas y las diferentes formas de violencia que viven las mujeres. Se demostró la importancia de los espacios de información y reflexión sobre la representación y la diversidad.

PALABRAS CLAVE: Formación de profesores; Escuela primaria; Enseñanza de Ciencias; Mujeres científicas.

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Introduction

Violence against women has a structural nature and occurs on a global scale, in public and private spheres. This reality is recognized and denounced by feminist movements and women's organizations that defend human rights, as well as by academic research (Almeida, 2014; Bandeira, 2014; Carapia, 2015). Emotional, physical or sexual violence against women manifests itself through patriarchal[4] domination and oppression, creating conditions in which they are discriminated and objectified, preventing them from being recognized as subjects (Saffioti, 2015).

Then, it is important to redefine the concept of "woman", recognizing the diversity present in this group to not perpetuate a type of social violence that naturalizes the white, educated, middle-class, heterosexual woman as a unifying representative of this group of people (Macedo, 2015). Therefore, "[...] it follows that woman is a term in process, a becoming, a construction that cannot be said with certainty to have an origin or an end [...]" (Butler, 2018, p. 54).

[4] Saffioti (2015) understands patriarchy as a structural system of male domination that permeates social, political and economic relations. Patriarchy is not an isolated phenomenon, but is intertwined with other forms of oppression, such as class and ethnic ones.

Based on this conceptualization, it is essential that society takes a position in the cultural and institutional sphere, demanding public policies to prevent and combat violence against women, in addition to guaranteeing comprehensive assistance to women in vulnerable situations. In this perspective, "School Week to Combat Violence against Women", sanctioned on June 11, 2021, by Law N. 14,164, included in the Basic Education curriculum topics related to human rights, as well as prevention and combat of violence against women, children and adolescents. Activities aimed at training the school community, especially teachers, are also planned to disseminate knowledge and promote critical reflections on Maria da Penha Law (Brasil, 2021). Maria da Penha Law originated in 1983 when Marco Antônio Heredia Viveiro tried to kill Maria da Penha twice.

For Saffioti (2015), expressions of violence are the result of social structuring of gender. The concept of gender is polyphonic, but it cannot be confused with a biological determination, nor limited to the dichotomy between man and woman, since it is changeable, resulting from different historical and social contexts (Louro, 2014). According to Butler (2018), there is one of gender performativity that "is culturally constructed: consequently, it is neither the causal result of sex nor as apparently fixed as sex" (p. 21).

Therefore, the school, like other social institutions, is based on gender relations (Louro, 2014). Thus, the Brazilian education system faces the challenge of promoting gender equality. Soares and Monteiro (2019) highlight that initiatives aimed at addressing this issue within the public education system are confronted with different "[...] moral, cultural, religious, family values and norms that permeate the issues of gender and sexuality [...]" (p. 302).

Regarding Science teaching, disciplinary and curricular knowledge needs to include issues that discuss gender inequalities as reflections of a historical construction and not justified based on

biological differences (Heerdt; Batista, 2017; Coutinho; Rotta, 2024). Wherefore, we observed in our experiences that science teachers at some public schools in *Distrito Federal* had difficulties in promoting activities related to the "School Week to Combat Violence against Women" in their classes. Thus, we aim to analyze which strategies could favor the development of gender themes in science classes during this week within the school environment.

Thereunto, an extension course was proposed focusing on discussion of historical and social issues that led to discrimination and gender asymmetry in different social spaces, and to propose pedagogical intervention with science teachers. The objective of this work, an excerpt from a master's dissertation, is to understand how a proposal for continuing education, developed with science teachers in the final years of Elementary School, contributed to development of pedagogical practices that promote reflection and gender inclusion.

Gender violence and women in science

Gender inequality has historically been ensured by Brazilian laws, exposing women to violence instead of protecting them (Safiotti, 2015). Aggression against women is more frequent in domestic environment, and the aggressors are known men or even family members. In Brazil, as in other Latin American countries, violence against women is more pronounced due to social inequality (Carapia, 2015). Every 24 hours at least eight women become victims of domestic violence, involving threats, aggression, torture, insults, harassment and femicide (Campos, 2024).

According to Bandeira (2014), in the 1970s, Brazilian feminists mobilized to denounce sexual violence and this issue became central. It paved the way to create specialized support services and specific legislation, such as the Special Police Stations for Assistance to Women, and Maria da

Penha Law, sanctioned in 2006 (Brasil, 2006). Within the educational sphere, the institution of the "School Week to Combat Violence against Women" (Law N. 14,164/2021) was considered a victory, as it provides guidance for raising awareness and preventing violence (Brasil, 2021).

It is important to highlight that gender violence and sexism also occur in academic environments and in Science, Technology, Engineering and Mathematics (STEM), in which women face challenges and discrimination (Finco; Santos, 2024). Studies indicate that girls' interest in STEM seems to decrease with age, a fact that may be related to the attitude of those responsible for children education or related to teachers who seem to encourage girls less to pursue scientific careers (Oliveira-Silva; Parreira, 2022).

Gender discrimination in science is aggravated by social markers such as race and gender. The concept of intersectionality was introduced by black feminists who contested the fact that traditional feminism did not consider the demands and rights of black women. Black feminism highlighted different perspectives on oppression and addressed how the relationship "[...] of categories and/or systems of oppression of gender, class, race, ethnicity, sexuality, among others, produce, in an articulated way, inequalities and are mutually constituted" (Silva; Menezes, 2020, p.3).

Likewise, we observe that social identities such as race, gender and class do not operate in isolation but intertwine to create specific experiences of discrimination and privilege. Thus, violence affects women in different ways (Macedo, 2015). Therefore, create inclusive work environments for women is necessary. This includes implementing policies to combat sexual harassment, promoting equal pay and encouraging women to take up leadership positions (Batista; Rotta, 2021). As for science teachers, research reinforces that educational institutions need to include and problematize gender in the initial and continuing education of science teachers, enabling them to deepen their knowledge on the topic (Heerdt; Batista, 2017; Coutinho; Rotta, 2024).

Methodological paths

The research carried out was qualitative and pedagogical intervention type, which according to Damiani et al. (2013), aims to identify contributions of an intervention to changes in educational practices, focusing on solving practical problems present in educational institutions, and contribute to the analysis of teaching practice itself. Continuing education was held in three meetings in March 2023, during "Women's week"[5], in a public school located in *Distrito Federal*. The participants were six Elementary School Science teachers and to maintain their anonymity we used the codenames of national scientists: Bertha[6], Carlos[7], Elza[8], Enedina[9], Sonia[10] and Oswaldo[11]. All participants signed the Free and Informed Consent Form, recording their consent in writing.

The activity had 6 hours workload in person, and 6 hours dedicated to developing the pedagogical proposal (Table 1). This initiative was registered as a university extension activity, so that participants received a certificate issued by the university. The classes were expository and dialogic, with a focus on teacher participation.

[5] At times we refer to "School Week to Combat Violence against Women" as "Women's Week", to reflect the consonance with the teachers' statements.
[6] Bertha Lutz: biologist specializing in amphibians and suffragist.
[7] Carlos Chagas: public health doctor, infectious disease specialist and bacteriologist.
[8] Elza Furtado Gomide: first female PhD in Mathematics from the University of São Paulo.
[9] Enedina Alves Marques: the first black female engineers in Brazil. She was a teacher, worked as a manager in public works and in development of the Paraná Hydroelectric Plan.
[10] Sonia Guimarães: Brazilian physicist, the first black woman to earn a PhD in Physics and professor at Technological Institute of Aeronautics.
[11] Oswaldo Cruz: Brazilian physician, bacteriologist, epidemiologist and public health specialist.

TABLE 1: Continuing education details

Meetings	Program
1st	Highlight the importance of the "School Week to Combat Violence against Women", resulting from social and legislative achievements. Historically contextualize gender relations and the importance of bringing this approach to science classes. Presenting official documents and scientific literature that address the issue of gender in education.
2nd	Address historical and social issues related to the invisibility of women scientists. Suggesting teaching materials that can be used pedagogically to address this topic, including the game "Which Scientist Am I?" (*Qual cientista eu sou?*). Developing, for the next meeting, strategies and pedagogical suggestions to be worked on during "Women's Week".
3rd	Discussing with teachers the strategies and proposals for activities that will be carried out with students during "Women's Week".

Source: the authors.

As an instrument for obtaining data, "Conversation Circles" were used, guided by the following questions to promote discussions and reflections on teachers' experiences: why are there fewer women in science compared to men? What would be the reasons? What activities do you think could be developed during "Women's Week"? How could these activities raise awareness among students about violence against women? The meetings were recorded on video and audio, and later transcribed.

For data analysis, Discursive Textual Analysis (DTA) was used, according to Moraes and Galizazzi (2020). The participants' statements were the corpus of this research. They were deconstructed into units of meaning and grouped by similarity. Approach and classification according to the senses resulted in three final emerging categories: 1- Gender, violence and science teaching; 2- Visibility of women scientists; and 3- Teacher education. Next, we elaborated the metatexts, shown below.

Gender, violence and science teaching

At the first meeting, we presented Law N. 14,164/2021, which establishes the "School Week to Combat Violence against Women", and two teachers said that they were not yet familiar with the event. This institutional initiative corroborates the arguments by Louro (2014), when he highlights that these relationships permeate the school environment, because since their origin, educational institutions have separated, classified and hierarchized subjects.

Teacher Bertha reported that "with so many cases of violence in the media, this discussion in science class is important." Almeida (2014) argued that despite investments in programs that protect women, legal awareness, efforts to reframe society's mentality and guarantee rights, cases of violence are still significant. Thus, we realize that gender violence, based on patriarchy (Saffioti, 2015), is also expressed in academia, especially in STEM careers (Finco; Santos, 2024).

During the dialogues, with teachers' statements about inequalities in women's academic and professional lives, Teacher Oswaldo pointed out that "[...] women take a break from their careers, men don't!" He highlighted the difficulties women have in reconciling their family and professional lives, which was corroborated by all participants.

Obstacles related to entry and progression in professional and academic careers can be represented by metaphors such as the "glass ceiling", which reveals the invisible barriers of discrimination experienced by women in STEM fields, preventing their career advancement. Another is the "scissors effect" and symbolizes the gender asymmetry in professional hierarchies, and the "drain" of women throughout their professional careers (Oliveira-Silva; Parreira, 2022). Also, the "crystal labyrinth", where transparent walls and corridors symbolize the invisible difficulties that impede professional advancement (Batista; Rotta, 2021).

In this scope, two recent achievements have favored researchers. The first one, in force since April 15, 2021, allows the registration of the period related to maternity leave in their Lattes Resumé. The second was established by Law N. 13,536/2017 and authorizes the extension of scholarships granted by research funding agencies in cases of maternity and adoption leave (Brasil, 2017).

In the meantime, Teacher Sonia reported having a friend who is attending a master's in mechanical engineering, and that "[...] she suffers from being excluded by her colleagues, as the master's is alongside the Physics course, and she never had a group to work with and did everything by herself". When entering STEM careers, women face discrimination, which results in segregation, negatively impacting their self-esteem, often leading them to drop out of these courses (Fianco; Santos, 2024).

A similar fact was observed by Teacher Carlos, when he reported that "female university professors need to produce more, demonstrate their capabilities more and get involved in more projects than male professors to be recognized". He also highlighted that "they themselves said that when they were among doctors, they did not listen to them, and they had to constantly prove their abilities." In academic environment, women often have their epistemic authority questioned and their cognitive capacity belittled (Coutinho; Rotta, 2024).

A survey carried out by Avon Institute and Data Popular, in 2015, classified violence against women into six groups, one of which was "Intellectual Disqualification". It was highlighted that 49% of the women participating in the research had already been victims of this type of violence, manifested through offensive jokes or disqualification, solely because they were women (Data Popular/Instituto Avon, 2015).

Speaking from this perspective, Teacher Oswaldo pointed out that it is necessary to "expand the horizons of our students, showing that it is possible to be a woman and be a scientist". Given this scenario, the teachers participating in

this research highlighted that there is little representation of female scientists and, therefore, pedagogical proposals are needed in science classes to discuss the issues that impede and limit women. The visibility of female scientists has been more evident in research in recent years and contradicts the idea that women do not have the aptitude or knowledge to carry out scientific and technological studies (Fianco; Santos, 2024).

In that regard, Teacher Enedina worked with students on the film "Hidden Figures". For her, this film was important to value black scientists, since during her training as a Biologist, "a lot of emphasis was placed on male scientists, and with the film I was able to show the discrimination that exists against women in science". The teacher also reported that students were interested in the proposal, and said that until that moment, they had not noticed the gender asymmetry and racial discrimination in science. Thus, the film provoked discussions about how social markers of gender and race doubly impact the discrimination of black women (Hooks, 2024).

During the dialogues, we sought to find out whether teachers included gender relations and violence against women in their classes. Everyone stated that they wanted to develop pedagogical practices including this approach but had difficulties due to lack of knowledge about how to carry them out. Then, Teacher Oswaldo highlighted that he rarely addresses this topic, while the other teachers stated that they included the approach on different occasions, such as when teaching content related to human reproduction and sexual systems. However, there was little detail on how gender perspective was developed.

Teacher Sonia highlighted the importance of discussions, emphasizing: "so it is increasingly urgent that we talk about this in class, we need to prepare girls and boys so that this violence does not continue". This perception was added by two male and two female teachers, when they highlighted that, in science classes, it is necessary to talk about respecting individual choices regarding sexuality and gender. Macedo (2015)

emphasizes that "[...] the way in which the issue of reproductive rights and rights over the body itself still constitutes violence against women today, in the most diverse contexts" (p. 21).

In that regard, Teacher Enedina pointed out that she had already superficially addressed the topic, when "I used to talk about some female scientists, because they were not given as much emphasis in academic books and because I thought it was interesting to talk about female representatives as well". Research on textbooks has shown how women are represented in a stereotypical way (Louro, 2014), and rarely represented as scientists (Heerdt; Batista, 2017). Representation of black and Latino scientists is even lower (Ferreira; Silva; Santos, 2023).

Teacher Sonia added that every year she talks about why "Women's Day" is a result of women demanding their rights, since "[...] they were all trapped inside a factory that was set on fire". She said students were shocked by the exploitation that female workers suffered, and the harassment within the factories. This theme, according to Teacher Sonia, could serve as a starting point to initiate dialogues with students, also answer the question about why there is no "men's day". Teachers unanimously agreed that this proposal could constitute an appropriate pedagogical strategy to address the issue of gender.

Visibility of women scientists

Science is still often identified as a male activity and women have been made invisible or erased from the history of the production of scientific knowledge. The reasons why their contributions were silenced were numerous and were based on gender discrimination (Coutinho; Rotta, 2024). Then, Teacher Enedina emphasized that "the way women are treated in scientific field makes them give up, as many were treated as assistants and this makes them discouraged and give up". She also

added that "in the past, even if the woman had made the discovery, she could not sign the authorship".

When we discuss some of the reasons why female scientists are underrepresented or underrecognized, we identify in the teachers' statements expressions such as: "Family", "Children" and "Prejudice". Therefore, gender stereotypes condition and structure the activities and professions attributed to men and women, then women are destined to the caregiver role. This aspect makes it difficult to reconcile family responsibilities and carrying out professional activities (Batista; Rotta, 2021).

Despite the increase in women's access to higher education, we are still a minority in certain areas of knowledge, such as Physics and Computing. Thus, governments must also implement public policies and legislation promoting equal opportunities for women and girls in STEM (Oliveira-Silva; Parreira, 2022). In addition, the media must break with traditional gender representations and present women scientists as protagonists of their stories (Finco; Santos, 2024).

Aiming to expand teachers' knowledge about female scientists, we have made available some materials that could be used as pedagogical resources in science classes. A study carried out by Heerdt and Batista (2017) showed that teachers tend to have little knowledge about contributions of female scientists and knowledge about the life history of these professionals, facts that can contribute to the approach to gender in science classes.

The materials included the Pastimes books "Women Scientists: Coronavirus" (*Mulheres cientistas: Coronavírus*), "Black Brazilian Scientists Volumes 1 and 2" (*Cientistas Negras Brasileiras Volumes 1 e 2*), and "Women Scientists: Marie Curie" (*Mulheres Cientistas: Marie Curie*). These publications are the result of an action by the University Extension Project "Girls and Women in Science" (*Meninas e Mulheres nas Ciências*) (MMC, 2023). Just like the game "Which scientist am I?" (*Qual cientista eu sou?*), produced by one of the authors, to make

Brazilian female scientists visible, and available on the website "ensinodeciencias.info".

The materials were received with enthusiasm and teachers considered them as pedagogical options to initiate dialogues during "Women's Week". Teacher Carlos Chagas and Teachers Enedina and Sonia reported the importance of making free access books available, since they allow the visibility of different scientists. For Teacher Elza, "the game can broaden the horizons of our students, showing that it is possible, being a woman is being a scientist". Eiglmeier and Silva (2021) reported that games bring a playful and dynamic character to science classes and highlighted the importance of including the contribution of women in the history of science to overcome gender stereotypes and motivate students.

Teacher education proposal

The need for teacher training to include gender issues is highlighted to "[...] destabilize existing patterns and create conditions for teachers to rethink their views, discourses and practices associated with sexuality [...]" (Soares; Monteiro, 2019, p. 295). However, during initial and continuing education, these topics are not usually addressed and end up being one of the reasons why teachers do not teach issues related to gender and the contributions of feminism in the Sciences (Coutinho; Rotta, 2024).

The teachers reported that they had never participated in training related to the topic of gender and violence, but that they were interested in it, as it is a very present reality in everyday life, and that they needed knowledge and pedagogical strategies to address the subject in science classes. For Teacher Enedina, "it is important for us to get out of the bubble we live in, to learn how it works".

In this scope, we highlight the teachers' proposals as the final activity of the course, and that some of them have already been carried out, according to Teacher Elza's speech. She addressed the story of Marie Curie, which "helped a lot, because when working on Chemistry with 9th grade students, I was able to show how sexist society often places women in the shadows of men, as was the case with Marie Curie."

This discussion proposed by the teacher is necessary, because even among male teachers there are those who believe that women do not have the characteristics to occupy positions of command or leadership. Furthermore, they disqualify women's potential to act as scientists, arguing that science requires dedication and discipline, characteristics that they consider to be lacking in women (Heerdt; Batista, 2017).

Teacher Oswaldo emphasized that he intends to address the role of women in politics, but that he has not yet completed the activity. Teacher Enedina and Teacher Carlos reported that they will use the game "Which scientist am I?" Also, Teacher Sonia intends to work on texts about the history of "International Women's Day" and women's achievements in recent decades. Finally, Teacher Bertha said that she had not yet defined an idea but would like to associate it with the work she was already developing.

Regarding continuing education, teachers emphasized that they felt comfortable engaged in dialogue, since there was no imposition of ideas and reflections on the context involving the school community were important. Two male and two female teachers agreed that the proposal "opened their minds" and increased their knowledge on the subject, encouraging them to address the issue inside or outside the classroom.

Soares and Monteiro (2019) investigated the contributions of a course on pedagogical practice of Elementary School Science teachers and showed that continuing education had an impact on teachers, impacting

their pedagogical practices and their private lives, since it provoked reflections and changes in pedagogical perspectives regarding sexuality.

Teacher Bertha also highlighted that she has heard reports from students who have experienced or witnessed domestic violence: "unfortunately, many of our students grow up in homes where violence against women is routine and they end up growing up with this view that, depending on certain attitudes, women deserve to be beaten." For Safiotti (2015), society tolerates and even encourages male violence against women. Thus, the pedagogy of violence is perpetuated, in which it is natural for men to mistreat women, as well as for family members to attack children.

Conclusions

Learning more about the importance of "Women's Week" raised awareness among teachers about the need to address issues such as violence and gender in science, since they are recurrent in school environment and need to be discussed. Results from this research highlighted the importance of preparing teachers to integrate these contexts into their classes, since the lack of training makes it difficult.

The research showed that continuing education can be a strategy to reframe stereotypical views and enable pedagogical practices that include aspects related to gender violence. In that regard, participants' reports indicated that the training provided an opportunity to learn about activities such as games and books designed to visualize female scientists, which could be used as teaching resources during "Women's Week" to initiate dialogues about women's contributions to science. They also served to support the problematization of barriers and violence that women face in certain professional areas.

According to teachers, these topics have the potential to bring girls closer to science, since they can promote representation and identification

with scientists' profile, especially when they are presented in their diversity of ages, race and activity areas. Therefore, it would be possible to discuss how to break with the narrative of an exclusively male and elitist science, in addition to motivating students to recognize that women are victims of violence in different social spheres.

The teachers who contributed to this research had not yet participated in training that addressed these topics and demonstrated interest in the subject. This is a relevant fact, considering the current situation in Brazil, where reliable knowledge is needed to reflect on the reasons why certain issues are not accepted by conservative or religious groups. This is even more evident in the face of hate speech related to so-called "gender ideologies", which also accuse feminism of being harmful to the maintenance of family.

To understand how gender relations and violence are expressed socially, from this perspective and to propose educational actions that raise awareness in the community, investments, research and integration with the training of teachers who work in science education are required. Therefore, further research could analyze how training and profile of science teachers influence their pedagogical positions on these topics.

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