https://doi.org/10.1590/198053149179_en

MAPPING AND IMPORTANCE OF PROJECTS FOR GENDER EQUITY IN STEM EDUCATION

Gabriela Reznik[I]
Luisa Massarani[II]
TRANSLATED BY Jonathan Edwin Baracho Trindade[III]

[I] Universidade Federal do Rio de Janeiro (UFRJ), Rio de Janeiro (RJ), Brazil; gabirz@gmail.com

[II] Instituto Nacional de Comunicação Pública da Ciência e Tecnologia (INCT-CPCT), Rio de Janeiro (RJ), Brazil; luisa.massarani7@gmail.com

[III] Hill CellTech; contato@celltech.life

Abstract

In this article, we mapped the projects covered in the Conselho Nacional de Desenvolvimento Científico e Tecnológico [Brazilian National Council for Scientific and Technological Development] (CNPq) calls for Meninas nas Ciências Exatas, Engenharias e Computação [Girls in the Sciences, Engineering, and Computing] program, in 2013 and 2018, and we seek to understand, through interviews with five coordinators, their perceptions about the importance of projects. We identified the capillarity of projects in the country and increased female leadership in projects contemplated in 2018. We point to the social, educational and personal dimension of the projects, acting in areas of social vulnerability, training future teachers, and the university-school relationship, and for the incorporation of an intersectional feminist perspective in gender equity policies in science education.

GENDER RELATIONS • EQUITY • STEM EDUCATION • SCIENCE COMMUNICATION

MAPEAMENTO E IMPORTÂNCIA DE PROJETOS PARA EQUIDADE DE GÊNERO NA EDUCAÇÃO EM STEM

Resumo

Neste artigo, mapeamos os projetos contemplados nas chamadas do Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) para o programa Meninas nas Ciências Exatas, Engenharias e Computação, de 2013 e de 2018, e buscamos compreender, por entrevistas a cinco coordenadoras, suas percepções sobre a importância dos projetos. Identificamos a capilaridade no país e o aumento da liderança feminina nos projetos contemplados em 2018. Apontamos a dimensão social, formativa e pessoal na narrativa das coordenadoras sobre a importância dos projetos na atuação em áreas de vulnerabilidade social, na formação de futuros docentes e na relação universidade-escola, e a incorporação de uma perspectiva feminista interseccional nas políticas de equidade de gênero na educação em ciências.

RELAÇÕES DE GÊNERO • EQUIDADE • EDUCAÇÃO STEM • DIVULGAÇÃO CIENTÍFICA

MAPEO E IMPORTANCIA DE PROYECTOS PARA LA EQUIDAD DE GÉNERO EN LA EDUCACIÓN STEM

Resumen

En este artículo, mapeamos los proyectos cubiertos en las convocatorias del Conselho Nacional de Desenvolvimento Científico e Tecnológico [Consejo Nacional de Desarrollo Científico y Tecnológico] (CNPq) para Meninas nas Ciências Exatas, Engenharias e Computação [Niñas en Ciencias Exactas, Ingeniería y Computación], de 2013 y 2018, y buscamos comprender, a través de entrevistas con cinco coordinadoras, sus percepciones sobre la importancia de los proyectos. Identificamos la capilaridad de los proyectos en el país y el incremento del liderazgo femenino en los proyectos contemplados en 2018. Señalamos la dimensión social, educativa y personal en la narrativa de las coordinadoras sobre la importancia de los proyectos, en la actuación en áreas de social vulnerabilidad, en la formación de futuros docentes y en la relación universidad-escuela, y por la incorporación de una perspectiva feminista interseccional en las políticas de equidad de género en la educación científica.

RELACIONES DE GÉNERO • EQUIDAD • EDUCACIÓN STEM • DIVULGACIÓN CIENTÍFICA

CARTOGRAPHIE ET IMPORTANCE DES PROJETS D'ÉQUITÉ DE GENRE DANS L'ÉDUCATION EN STEM

Résumé

Dans cet article, nous avons cartographié les projets retenus dans le cadre des appels d'offres du Conselho Nacional de Desenvolvimento Científico e Tecnológico [Conseil National de Développement Scientifique et Technologique] (CNPq) pour le programme Meninas nas Ciências Exatas, Engenharias e Computação [les Filles en Sciences Exactes, Ingénierie et Informatique], de 2013 et 2018. À travers des entretiens avec cinq coordinatrices, nous avons cherché à comprendre quelles étaient leurs perceptions sur l'importance de ces projets. Nous avons identifié une bonne capillarité des projets retenus en 2018 sur le territoire national, ainsi qu'une augmentation de la direction féminine. Par ailleurs, la dimension sociale, formative et personnelle, présente dans les récits des coordinatrices, nous a permis de souligner l'importance de ces projets dans les zones de vulnérabilité sociale, aussi bien pour la formation des futurs enseignants et les relations entre l'université et l'école que pour l'incorporation d'une perspective féministe intersectionnelle dans les politiques d'équité de genre dans l'enseignement des sciences.

RAPPORTS DE GENRE • ÉQUITÉ • ENSEIGNEMENT STEM • DIFFUSION SCIENTIFIQUE

Received on: NOVEMBER 23, 2021 | **Approved for publication on:** MARCH 23, 2022

This is an open access article distributed under the terms of the Creative Commons license, type BY-NC.

SINCE 2010, WOMEN HAVE REPRESENTED APPROXIMATELY HALF OF THE TOTAL NUMBER of researchers in Brazil, and, in 2018, they represented about 45.1% of researchers in Latin America and the Caribbean (United Nations Educational, Scientific and Cultural Organization [Unesco], 2019). Although primarily encouraging, the disaggregated data demonstrate persistent inequality in the duration, level of ascension, and entry age of women in scientific careers. At a national and international level, there is inequality in the selection of scientific careers, in which women are more represented in careers related to care, health, and education, while men prevail in fields related to exact sciences and engineering.

Theoretical reflection on the relationship between gender and science began in the 1970s, when several feminist researchers began to emphasize the importance of the topic and accumulated empirical evidence on the marked relationship between sexism and science. Such reflections emerged in close relationship with the second wave of the feminist movement and the social study of science. The feminist critique of science came from a multidisciplinary field of researchers from such diverse areas – as philosophy, history, biology, and anthropology – and forcefully questioned the production of scientific knowledge and the notions of objectivity, universality, and neutrality that form the pillars of modern science (Harding, 1993; Haraway, 1995; Sardenberg, 2002).

In Brazil, gender studies in exact, technology, and engineering fields have been consolidating since the 2000s (Garcia & Sedeño, 2006; Carvalho & Casagrande, 2011; Freitas & Luz, 2017), with debates involving the field of gender and engineering (Lombardi et al., 2016), gender relations in Mathematics classes (Casagrande & Carvalho, 2014), inclusion and belonging in Engineering courses (Faulkner, 2007), and the field of education in Science, Technology, Engineering, and Mathematics (STEM) and gender (Oliveira et al., 2019). Key concepts for understanding these issues are horizontal segregation – concerning the existence of factors that influence women to occupy areas of lesser prestige and remuneration – and vertical segregation – concerning the factors that make it difficult for women to reach leadership positions, represented in such concepts as the "glass ceiling", "crystal labyrinth" and "leaky pipeline" (Schiebinger, 2001; Lima, 2013; Guedes et al., 2015). The debate has also been based on the theory of the sexual division of labor, in which the division "has as its characteristics the priority allocation of men to the productive sphere and of women to the reproductive sphere and, simultaneously, the occupation by men of the functions of strong added social value" (Kergoat, 2009, p. 67, own translation).

Melo and Thomé (2018) highlight that the achievements that enabled changes in the legal frameworks that governed female participation in Brazilian society were obtained through numerous disputes and a strong female presence. The authors argue that the period from 2003 to 2010 was one of the most productive for gender- and race-affirmative policies, through the creation of two secretariats with ministerial *status* and budgets, the Secretaria de Políticas para as Mulheres [Secretariat for Policies for Women] (SPM) and the Secretaria de Políticas de Promoção e de Igualdade Racial [Secretariat for Promotion Policies and Racial Equality] (Seppir).

It was through the SPM and the creation of the Programa Mulher e Ciência [Women and Science Program] (PMC) by the Conselho Nacional de Desenvolvimento Científico e Tecnológico [National Council for Scientific and Technological Development] (CNPq) that, in 2008, the debate on women's participation in science and technology was included in national policy guidelines for the first time. Brazilian policies and initiatives emerged from the disputes and tensions surrounding the need for gender equity policies in science education in the last decade, seeking to encourage young people's interest in STEM fields.

In this article, we maintain that gender and sex are socially constructed categories, which inform positionalities and asymmetries of power between men and women, taking into account

the intersections of class, race, sexuality, geography, among others. From this perspective, it is not possible to refer to the woman as a single category, but to women and feminisms, in their most diverse aspects, located in particular contexts and spaces. We will refer to feminisms, in their plurality and diversity, as movements related to reflections and actions aimed at ending subordination, inequality, and sexist oppression. Theoretical production that develops in a feminist context is characterized by being committed to political action, not limited to abstract knowledge, but guided by feminist political practice (Facio & Fries, 1999).

In the Brazilian context, while the issue of greater inclusion and participation of women in science and technology was included in the national policies in 2008, through the II Plan of Policies for Women, the debate was absent from the national science and technology policies until 2016 (Lima, 2017). The insertion of the theme first appears, in a timely manner, in the chapter titled "Main Trends in ST&I Policies", of the 2016-2019 National Strategy for Science, Technology, and Innovation, in which it is mentioned that policies to combat gender inequalities in science and technology have been adopted by other countries, being highlighted as a trend (Lima, 2017).

Implemented in 2005, the Programa Mulher e Ciência is considered a milestone in the inclusion of gender issues in Brazilian politics (Lima & Costa, 2016). The PMC aims to stimulate scientific production, and the reflection on gender relations, women, and feminisms throughout the country, and to promote the participation of women in scientific and academic careers. Since its creation, the program has implemented three main initiatives: public calls for support for scientific research on "women, gender relations, and feminisms", through financial resources and scholarships; the annual "Building Gender Equality" award, given to high school, college, and graduate students; and the triennial "Gender and Science" meeting, bringing research centers together in order to discuss scientific production in the areas of women and gender relations in science (Lima, 2017).

Policies for gender equity in science education

Within the scope of the Programa Mulher e Ciência, the Meninas nas Ciências Exatas, Engenharias e Computação program [Girls in the Sciences, Engineering, and Computing] has overseen two rounds of projects: one in October, 2013 and the other in August, 2018. Their stated goals were to encourage the participation of women in exact and technology fields, where women are systematically underrepresented from the beginning of their careers onward, and to fight against the horizontal segregation that occurs when entering the field of science and technology.

The first round of projects – entitled MCTI/CNPq/SPM-PR/Petrobras n. 18/2013 Meninas e Jovens Fazendo Ciências Exatas, Engenharias e Computação [Girls and Young People Doing Science, Engineering, and Computing] – was allocated 11 million reais and implemented through partnerships between CNPq, SPM, Petrobras, and the Ministério da Ciência, Tecnologia e Inovações [Ministry of Science, Technology, and Innovation] (MCTI). The program encouraged the formation of professionally diverse teams by integrating researchers from universities and research institutes, undergraduates, educators, and students from high schools and elementary schools, with three types of scholarships that were awarded to these segments – with the exception of project coordination. All projects were required to be coordinated by researchers linked to research institutions in the exact, engineering, and computing areas, and composed of a graduate student in these fields, two to four high school students, and an educator from the same high school as the students.

It is noteworthy that a minimum of 30% of these resources was required to be allocated to projects coordinated by researchers associated with institutions based in the North, Northeast, or Midwest regions of the country. In addition, although doctorate level degrees were required of coordinators from other regions, project coordinators from institutions in these regions were

permitted to hold only a master's degree. In this call, of 528 submissions, 325 projects from 107 institutions were approved, contemplating, in the three types of scholarships foreseen, approximately 1,500 scholarship holders throughout the country (Lima, 2017).

In the 2018 iteration, entitled CNPq/MCTIC n. 31/2018 – Meninas nas Ciências Exatas, Engenharias e Computação [Girls in Sciences, Engineering and Computing], 78 projects approved out of 702 submitted projects involved about 360 schools. The Ministério da Educação [Ministry of Education] doubled its initial budget of 3 million reais, intending "to arouse the vocational interest of female students in primary and secondary education and to combat the evasion, which occurs mainly during the first years, of female students of undergraduate courses in this area" (MCTIC/CNPq, 2018, own translation).

The project could involve one, three, or five public elementary or high schools, with grants awarded to – depending on the number of schools involved – 3 to 15 primary or secondary school students, one to three undergraduate students, or one to five educators. In this iteration, a master's degree was sufficient for submission regardless of region. One of the analysis criteria was the gender of the candidate, scoring ten points for females. The absence of an intersectional look in the texts of the calls is highlighted, although several of the projects incorporated this dimension into their objectives.

The Elas nas Exatas [She in STEM] initiative, concomitant with the efforts of CNPq, launched, in 2015 and 2017, the programs Gestão escolar para equidade: Elas nas Exatas [Equity conscious scholastic administration: She in STEM] (Fundo Social Elas, 2017), which aimed to "contribute to breaking a pattern of pre-established values that discriminate against girls in STEM fields, and promote opportunities in the fields of science and technology" (Unbehaum & Gava, 2017, p. 4, own translation). The initiative sought to support school programs focused on fighting gender stereotypes and increasing school administrators' awareness of these themes through the inclusion of public high school students. In the first project, 10 out of 175 submitted projects were selected and developed throughout 2016, representing 8 Brazilian states. In the second program, 10 out of 113 proposals were selected and developed throughout 2018, representing all 5 regions of Brazil.

Regarding the research and evaluation of projects and calls, there are studies which evaluate the Elas nas Exatas program (Unbehaum & Gava, 2017), which present an overview of the Chamada n. 18/2013 program as a policy (Lima & Costa, 2016; Lima, 2017), which bring an evaluation of projects carried out under the Chamada n. 18/2013 in the state of Paraíba (Queiroz, 2018), and analysis of the materials produced by the projects covered by Chamada n. 18/2013 (Caseira & Magalhães, 2019). Publications were also produced by the projects' teams (Brito et al., 2015; Maciel & Bim, 2016; Witovisk et al., 2018; Herrera & Spinelli, 2019; Galdino da Silva et al., 2020).

Based on the evaluation of the program Elas nas Exatas, Unbehaum and Gava (2017) formulated five parameters for the development of gender equity projects in schools: (i) school involvement in program design, planning, and execution; (ii) administration access to technical and theoretical support on gender issues; (iii) continuing teacher training; (iv) focus on girls' learning in science subjects, strengthening them in the contents of these areas; and (v) partnership-based project development, promoting local involvement, continuity, and consolidation.

Regarding the evaluation of Chamada n. 18/2013 (MCTI/CNPq, 2013), Lima (2017) highlights the inclusion of areas into the theme of gender that had not previously been considered by the PMC initiatives on gender, women, and feminisms. It was additionally concluded that this program positively influenced the development not only of Elas nas Exatas but also of university programs, such as the Meninas na Ciência [Girls in Science] of the Universidade Federal do Rio Grande do Sul (UFRGS).

Queiroz (2018) investigated the development, implementation, and results of twenty projects from Chamada n. 18/2013 in Paraíba, at universities and the program Ensino Médio Inovador (high schools that have implemented a more flexible, redesigned curriculum from the Ministério da Educação). The author evaluated the implementation and results of projects based on the Policy Cycle Approach, interviewed national managers from CNPq and SPM, and coordinators, educators, and students from high schools. Queiroz highlighted the absence, in 10 of 11 analyzed projects, of gender discussions in documents produced by coordinators. She argues that:

> . . . this may indicate a weakness of the program in relation to the achievement of its objectives, which resulted in the underrepresentation in STEM being relegated to a secondary consideration, even in projects with resources specifically allocated to address this theme, and suggests that the effects of these projects were limited in scope. (Queiroz, 2018, p. 284, own translation).

In regard to the scientific production of project coordinators in Paraíba, Queiroz (2018), identified that only 6 of the 11 coordinators cited their participation in Chamada n. 18/2013 on their Curriculum Lattes profiles, with only 3 having published articles that explicitly address gender issues. The author uses this fact to support the argument that a cohort of coordinators submitted projects without having any substantial interest in contributing to the debate on gender relations in the sciences.

Based on the evaluation of the projects in Paraíba, Queiroz recommends to involve school administrators in projects on gender equity; to deconstruct the idea of vocation on the students' career choices, highlighting the gendering of educational spaces; to allocate, in public calls, resources to school infrastructure improvement and transportation for participation in off-*campus* events; and to extend the execution period of projects in continuous flow; among other suggestions (Queiroz, 2018). Queiroz's evaluation process was shared with the CNPq team and resulted in changes in the following program, carried out in 2018, including requiring the donation of equipment obtained for project purposes to the school, as well as a longer implementation period.

Methodological approach

Project mapping

In this article, we analyzed projects from the MCTI/CNPq/SPM-PR/Petrobras n. 18/2013 and CNPq/MCTIC n. 31/2018 Meninas nas Ciências Exatas, Engenharias e Computação (MCTI/CNPq, 2013, 2018) programs. We chose to analyze these programs due to their *status* as milestones in affirmative domestic policy promoting gender equity and the encouragement of the creation and continuity of projects incentivizing the inclusion of girls in science. This article is part of a broader initiative that seeks to understand the motivations, experiences, and perceptions of young women participating in these projects in the state of Rio de Janeiro. In order to understand the context in which the projects were carried out, we mapped the projects at both the national level and, in particular, in the state of Rio de Janeiro. This state was chosen due to being awarded the second with the most projects approved in 2018.

Initially, we analyzed the project distribution by region and by state in the country and the proportion of men and women in project leadership, at national level, through the comparative analysis of project coordinators' genders in the 2013 and 2018 programs. Then, we analyzed Rio de Janeiro state-level data, in which we identified the approved projects by title, coordinating institution, and funding program; analyzed each project's thematic scope, considering the primarily addressed

fields; identified the period of creation and duration of the projects; and analyzed the scientific production – scientific articles published in peer-reviewed journals, book chapters, and complete works published in proceedings of conferences – resulting from involvement in the projects until November 2021.

We obtained the project coordinators' names and associated institutions from the CNPq website. Project titles, fields of study linked to the coordinators' areas of expertise, project start dates, and published works were obtained through access to the coordinators' *curricula* on the Plataforma Lattes and proposals of the projects approved in 2013, provided by CNPq. Tabulation and data visualization were performed in Excel. This project was approved by the Comitê de Ética em Pesquisa do Hospital Universitário Clementino Fraga Filho [Clementino Fraga Filho University Teaching Hospital Research Ethics Committee], from Universidade Federal do Rio de Janeiro (UFRJ), on December 30, 2018 (Report n. 3,104,663).

Interviews with coordinators

Semi-structured interviews were carried out with five project coordinators in the state of Rio de Janeiro between March and May 2019, with an average duration of one hour, in order to better understand their perceptions about the importance of the projects. The coordinators will be referred to in the text by the pseudonyms Isabela, Conceição, Bell, Angélica, and Rupi.[1] The interviews were recorded and transcribed. The coding step was performed with the QDA miner 4.0 software. Interview content analysis involved the creation of categories and codes *a priori*, based on the theoretical framework of feminist science studies, and, *a posteriori*, according to the emergence of themes and discourses enunciated by the participants. The coding process was iterative, taking place over several readings of the material.

This project's coordinators are white women with degrees in physics, chemistry, and mathematics, between 45 and 55 years old, from different locations – Rio Grande do Sul, São Paulo, Buenos Aires and Rio de Janeiro –, mothers of one to three children (aged between 7 and 27 years old), having been employed as professors in universities and educational institutions since the 2000s, approximately, and hold doctoral and post-doctoral degrees. Two coordinators were previously CNPq level 2 productivity scholarship holders.

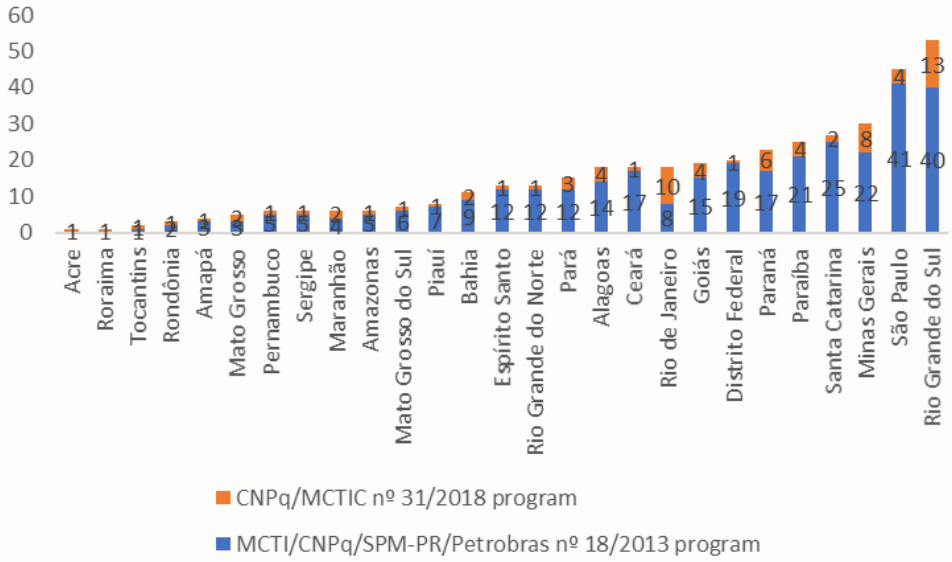
Geographical project distribution

The 2013 initiative approved 325 projects, four times the number approved in 2018 (78) – which does not necessarily reflect a decrease in the number of people involved, as, in 2018, projects could involve from one to five schools, while in 2013 each project was limited to one school. However, 2018 project financing totaled approximately half of the amount made available in 2013.

Regarding state-level distribution, all 26 states and Distrito Federal [Federal District] had projects approved in both programs (Figure 1), with the highest number in the South, Southeast, and Northeast regions (Figure 2). When considering the 2013 and 2018 programs together, the state with the highest number of projects approved was Rio Grande do Sul (53), followed by São Paulo (45), Minas Gerais (30), Santa Catarina (27), and Paraíba (25). In Rio de Janeiro, 18 projects were approved, 8 in 2013 and 10 in 2018 – the second highest of all states in Chamada n. 31/2018.

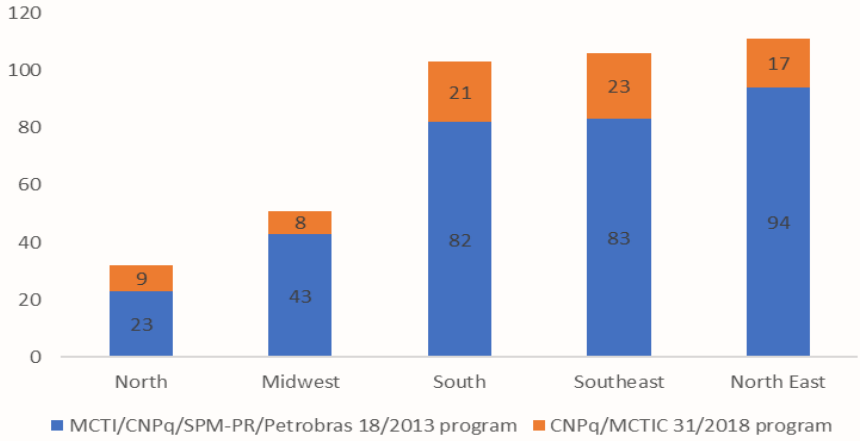
1 Names inspired by the writers Isabela Figueiredo and Conceição Evaristo, the feminist writer and theorist bell hooks and the poets Angélica Freitas and Rupi Kaur.

Figure 1
State-level distribution of projects funded by the CNPq programs Meninas nas Ciências Exatas, Engenharias e Computação of 2013 and 2018



Source: Authors' elaboration based on research data.

Figure 2
Regional distribution of projects funded by the CNPq programs Meninas nas Ciências Exatas, Engenharias e Computação of 2013 and 2018



Source: Authors' elaboration based on research data.

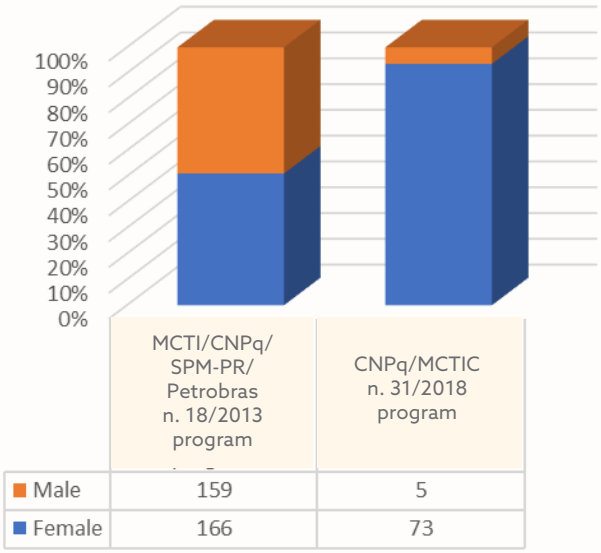
In Chamada n. 18/2013, the Northeast region received the most approvals (94 projects), while in Chamada n. 31/2018, the Southeast region received more (23). The North and Midwest regions had fewer projects developed in both initiatives, with Distrito Federal and Goiás being responsible for the largest number of projects approved in the Midwest in 2013.

Female leadership

Regarding the gender, there is a change in the percentage of women coordinators in the 2013 and 2018 programs (Figure 3). While, in 2013, the female coordinators were responsible for 51% of the projects, in 2018, they represented around 94%. This change can be explained by the project

approval criteria, which, in the 2018 call for proposals, included an explicit preference for female coordinators, as well as by the previous round's evaluation's conclusion that many projects did not focus on gender equity issues in the development of activities (Queiroz, 2018).

Figure 3
Coordinator gender distribution in the CNPq programs Meninas nas Ciências Exatas, Engenharias e Computação in 2013 and 2018



Source: Authors' elaboration based on research data.

Projects in the state of Rio de Janeiro

Of the 18 projects developed in the state of Rio de Janeiro, 2 were included in both programs. A list of approved projects can be found in Appendix 1. Associated institutions include public and private universities, federal institutes, research institutes, and cultural scientific spaces. The institution with the highest number of projects was UFRJ, with 6 projects (3 in each program), followed by the Instituto Federal de Educação, Ciência e Tecnologia do Rio de Janeiro [Federal Institute of Education, Science, and Technology of Rio de Janeiro] (IFRJ) and the Universidade Federal Rural do Rio de Janeiro [Federal Rural University of Rio de Janeiro] (UFRRJ) with two projects each.

Regarding the gender of the coordinators, in 2013, 6 projects were coordinated by women and 2 by men, and, in 2018, all 10 projects were coordinated by women. Analysis of project titles and objectives revealed that the projects approved in 2018 had a greater focus on gender issues. Many of the projects approved in 2013 did not even mention whether or not the project was intended for girls in its title and objectives. The fields of study most commonly covered by the projects in Rio de Janeiro were physics (4), chemistry (4), computing (3), agronomy (2), and mathematics (2), followed by astrophysics (1), production engineering (1), and environmental engineering (1). There was more diversity in this respect in 2018, with chemistry (2), computing (2), and mathematics (2) being the areas with the highest number of approved projects.

As for the duration of the projects, the authors identified that 5 of the 8 projects approved in 2013 continued their activities after the end of CNPq funding, although it is not possible to evaluate their subsequent maintenance and development from the data obtained on Plataforma Lattes. Of those awarded in 2018, 2 projects had previously been awarded in 2013, and 2 had initiated their activities in 2016 with institutional resources. It is not yet possible to say whether these projects will

continue past the CNPq funding period as this analysis was carried out while the projects were in progress.

From the works published on the coordinators' Plataforma Lattes profiles – "complete articles", "published book chapters", and "complete works published in proceedings of conferences" –, we sought to identify scientific production resulting from the development of these projects, which mentioned the debate on the issue of gender in science (Appendix 1). We identified project-related scientific publications in almost half of the projects (7 of the 16 projects). It is worth mentioning that most of the projects contemplated in 2018 started their activities at that time, which would justify the absence of publications during the analyzed period, as a result of the time necessary for articles to be processed by journals.

Coordinators' perceptions

With regard to perceptions about the importance of the projects, we categorized the narrative of the five coordinators into four dimensions: (i) social dimension, referring to the student participants, in which the coordinators cite the importance of the project in terms of social inclusion, facilitating admission to university, making choices and broadening horizons for the future, as well as dialogue on their geographical location and with the families; (ii) formative dimension, in reference to undergraduate students, when coordinators reflect that the experience of undergraduates as future professionals and teachers would have a multiplier effect and expand the reach of the experience, both in terms of science communication and in the training aspect of gender themes in science; (iii) formative dimension, in reference to the coordinators themselves, demonstrated in their strengthened relationship with the public school and school community, their involvement and appropriation of literature on gender and science, and the expansion of their network of related research contacts; and (iv) personal dimension, with regard to coordinators' personal satisfaction with their role in the project, giving back to society, and taking responsibility in the face of young people's expectations.

Social dimension

By involving young people in socially vulnerable areas, most of whom are Black women, the role of these projects is not limited to stimulating interest in science: it extends to stimulating young women's interest and confidence in entering a university degree program. With regard to sense of belonging and identity, values reinforced in many groups of girls and women can conflict with their own perceptions of STEM fields (Leaper, 2015). Ong et al. (2018) address Black women's challenges in persisting in STEM education, and how these struggles lead them to seek out or create "counterspaces" – academic spaces that allow minorities to further their own learning, in which their experiences are validated and recognized, as well as sharing experiences of isolation and discrimination. In this way, these projects can represent safe spaces for sharing and support, in which these young women feel a sense of belonging and increased confidence, as exemplified in the following statements.

> *It's a project that has a lot of potential in that sense, this very strong, well-marked social imprint. The girls involved won't necessarily choose careers in science, and that is not the objective either. Of course, we want to show, we want to attract, but I didn't intend to attract 100% of the girls. But to make them realize that they are capable, to make them interested in getting a bachelor's degree, to continue their studies and not stop, to find themselves, because, whether they like it or not, it's an opportunity for self-knowledge too, you know? I think it leaves that impression. They end up having a certain role in school. So I think this also values the student at school and I think it opens up opportunities, opens their minds for the future.* (Conceição).

Even if it wasn't to study at [name of university]*, but to encourage them to go study, to continue studying. So my idea was really this. It was to show public schools that science can be done, it is not something that is so far from their reality.* (Isabela).

Along with the view on the importance of encouraging entry into university, the coordinators' speeches mention the projects as spaces that subjectively mobilize the perceptions of young people in terms of their ability to make choices, as well as expanding horizons for the future.

I think this thing of showing girls an option is important. I had this freedom to choose, which I think was the best thing my parents gave me, they gave me this thing of studying, of being able to study without having to stop studying and do something else, and the freedom to choose. I think people have to be free to choose. (Rupi).

It is to increase the possibilities in these girls' perceptions of the world. So I don't want to focus only on the exceptional stories. I want to show that there are exceptions, but I think that when we show something that is very difficult to achieve, it does not become a possibility, a dream, an identification. I want girls to have this, to normalize this, I want them to have the awareness to make decisions. (Bell).

The social dimension is also engaged in discussion on identity and geographic location, for example in the case of one of the projects that works directly around the coordinating institutions, in an area of social vulnerability.

I think that one of the strengths of this project is that it is a local thing and it talks about where they're from, it is really about the geographic territory, both the museum territory and the university territory, and I understand this as valuable, especially for the students, talking to them about themselves. (Conceição).

A highlight of the social dimension is the importance of involvement and establishment of bonds with families. The involvement of family members as relevant social agents is essential for the development of young people's interest and motivation in a scientific career (Lazarides & Ittel, 2013; Eccles, 2015).

One thing we did, which was important, was to get closer to the families. Suddenly it starts: "Gee, the girl hasn't been attending". I said: "Think about it. If you are the girl's mother, you don't know who these university women are who are coming here to talk to their daughters". Then we promoted a picnic with the families, it was a highlight of the project. (Rupi).

Formative dimension for undergraduate students

The importance of having a space dedicated to studying academic production on gender inequalities in science is highlighted as one of the projects' potentialities. One of the coordinators reported that the initial activity carried out with the undergraduates was to seek bibliographic references on the theme of gender in science, so that they could become familiar with concepts such as the "Matilda effect" (Rositer, 1993) and "horizontal and vertical segregation", in addition to looking critically at their own behavior, exemplified in the following speech.

I told the girls that their first task was to get these two articles. Each one brought two reports. One from a scientific article that looked at the gender issue and one from an experience similar to our project. And we learned a lot of things together, you know? It was at the first official meeting that they had to do this. We discussed the Matilda effect and, reading the articles, the girls realized that they referred to the authors as if they were men. And they corrected themselves. They explained to each other what vertical segregation was, horizontal segregation,

> *the effect... so look at the vocabulary they were building. And I get goosebumps because that changes things. They're at the beginning of their degree, you know? Of life. It changes their perspective... they became teachers in their own right after this experience.* (Bell).

The importance of the project in training educators who work in favor of gender equality and from a non-sexist perspective of education appears in the coordinator's speech, which highlights the multiplier effect of the initiative, since the undergraduates, by experiencing a scientific dissemination project on gender themes, can take this experience into their future work as teachers.

> *For me, the most important pillar of the project is the future teachers. Because the project directly affects fifteen girls who, I don't know, five, ten will really get involved and the project will have an effect and they will align themselves with mathematics or similar areas. But with five graduates there will be much more than fifteen students in the future. I'm interfering in the training of these graduates, you know? They are looking at their practice, at their future careers from a perspective that traditional training does not provide.* (Bell).

Formative dimension for coordinators

Becoming more familiar with the realities of public schools and getting closer to families and the school community, appropriating feminist scientific literature and expanding the relationship between researchers through exchanging experiences and forming or growing networks were issues highlighted by the coordinators. One of them reported that she became more attentive to the theme and the importance of exchanges with other researchers, as in the following statement.

> *It was nice to meet other professionals who do this kind of thing, these programs. For example, I met a girl in [Brazilian city] who also did an exhibition about women, I met another one from [Brazilian city] who did an exhibition about women mathematicians, so to get to know these other initiatives was, I think, super important and changed my perspective, made me more attentive. More attentive, seeking more bibliographies, learning more about the literature, starting to write a little about it too, so I think it refined my taste for the subject.* (Conceição).

The universities' approach to the schools universe was highlighted as an important aspect of the project, which relates the difference in time dynamics with high school students and the recognition of the quality of public education and the challenges of students living in socially vulnerable regions when they become university students, as demonstrated in the following excerpt.

> *In high school you spend a lot more time with each person, you have a more personal relationship. At the university, you spend six months just lecturing that person, this is also a relationship, as I said, that is colder and more distant between the professors and the students. So I think that this thing of living with high school students for a long time and getting to know the family, we know a little more about their reality, sometimes understand a little more about their reality. The reality of those who live in [name of the region], the distance to come here, to see that more concretely: I take transportation, I go there and see. So when I have my students who live in [region name], I have a totally different perception than I had before. If the person is late, the difficulty that exists in coming and going, what are the difficulties at the school itself. I have a much better view of public schools in Brazil than I did too, that's another thing. That changed a lot in my head, I had no idea what public school was like here.* (Angélica).

Personal dimension

The fact that the project is an opportunity to give back to society stands out as a defining characteristic of the personal dimension. This motivation appears constantly in the literature on

scientists' perceptions of the importance of dissemination activities, being characterized as a moral obligation of scientists. Castelfranchi (2010) argues that public science communication has become an inherent part of technoscience, and that it represents not only an obligation from the scientists' point of view, but also a political, economic, and strategic right and necessity. The argument, by the coordinator, about the need to give feedback to society is exemplified below.

> *We stay here at the university, do this work and always hear everyone say: "Oh, the scientists stay there, they don't do anything for society" and I think it's a nice thing for you to give back, and this is our way of giving back to society. We do research that doesn't have an immediate application, our research is basic research, which is important, but doesn't have that kind of return*. (Rupi).

One of the coordinators also highlighted a sense of responsibility to young people when she identifies that their expectations are broader than just learning about a certain field, they want a change in their quality of life.

> *We asked: "What do you expect from the project and such?", then there were those answers: "Oh, I hope to have a better life". What do you do with that? That kind of thing makes an impact, it's like "Now what?", you feel the responsibility of what you're doing*. (Rupi).

The coordinators' perceptions of the projects' importance also incorporate the possibility of carrying out a project in which they have an identity and a place to speak, which generates personal satisfaction.

> *This is my positionality, doing science as a woman is my place. What I think is even more important is to show these girls how wonderful it can be to do science, how we can find ourselves and be happy and develop a career that gives us pleasure, that gives us satisfaction, like science. For me, this project, in terms of research, is one of the projects that makes me the happiest, I'm really happy*. (Conceição).

Discussion and final considerations

The CNPq Meninas nas Ciências Exatas, Engenharias e Computação programs were important milestones for affirmative policies designed to promote gender equity in Brazil and encourage the creation and continuity of projects aimed at stimulating girls' interest in science. These programs had a multiplier effect on gender initiatives in STEM education (Brito et al., 2015; Lima & Costa, 2016; Lima, 2017; Oliveira et al., 2019).

With just over half of the budget of its predecessor, the program launched in 2018 awarded about a quarter of the number of projects awarded in 2013; however, the involvement of up to five schools in the more recent program allowed the projects to involve a broad audience. In the Brazilian context, the programs covered all five regions of the country, with emphasis on the Northeast, South, and Southeast regions. Considering both programs, the states with the highest number of projects approved were Rio Grande do Sul, São Paulo, Minas Gerais, Santa Catarina, and Paraíba.

The decision to favor female coordinators in the project selection criteria increased the proportion of projects coordinated by women from 51% in 2013 to 94% in 2018. This preponderance of female leadership does not necessarily imply a feminist policy agenda in science education, as bell hooks (2018, p. 25, own translation) argues: "a person does not become an advocate of feminist policies simply because they have the privilege of being born as a woman. As with all political positions, a person adheres to feminist politics by choice and action". In order to assess the inclusion of gender

and feminism discussions in the projects based on the change in the profile of the coordinators, studies aimed at this theme would be pertinent.

Seven of the 16 projects in Rio de Janeiro had their work published; however, the projects awarded in 2018 are still in progress and may generate future publications not included in this article. It is noteworthy that, in 2018, all the project coordinators in Rio de Janeiro were women, and all the projects included the encouragement of girls' interest in the exact sciences in their titles and objectives. Over the last five years, in addition to the projects approved by these programs, numerous initiatives have emerged in Rio de Janeiro and across the country focused on promoting the interest of girls in science. The CNPq programs seem to have acted as a catalyst in the dissemination of initiatives on this topic, such as the public notice "Faperj n. 09/2021 – Programa Meninas e Mulheres nas Ciências Exatas e da Terra, Engenharias e Computação [Girls and Women Program in Sciences, Engineering and Computing]", intended to promote projects in Rio de Janeiro (Fundação Carlos Chagas Filho de Amparo à Pesquisa do Estado do Rio de Janeiro [Faperj], 2021).

One of the objectives of the CNPq Programa Mulher e Ciência was to bring gender and feminism studies into the mainstream of other fields of study, which need more discussion and appropriation of these themes, as Lima and Costa (2016, p. 34, own translation) point out: "we have the double challenge of promoting studies on science and technology in gender studies and of expanding the incorporation of the gender perspective in areas where this discussion is absent". Incorporating the discussion of gender into the production of knowledge would allow both to raise novel research questions that were not previously incorporated and to produce and circulate non-sexist knowledge that would, in turn, encourage greater participation of women in the sciences (Schiebinger, 2008).

By funding researchers from the fields of exact sciences, engineering and computing, the CNPq programs provided an expansion of this discussion to fields with little accumulation on this theme. However, it would be important to expand the discussion of gender studies in the projects, as well as an intersectional perspective, which takes into account the multiple and variable effects of different social markers – such as race, class, territory, and sexuality – that shape complex social inequalities (Brah & Phoenix, 2004; Piscitelli, 2008). From an integrated approach, intersectionality is a concept that arises from the claims of the Black feminist movement and seeks to account for the complexity of identities and social inequalities. In this sense, intersectionality represents more than just recognizing the existence of multiple systems of oppression, being better defined as an understanding of how interactions between these categories produce and reproduce social inequalities (Akotirene, 2019).

A feminist scientific policy, according to Castro and Chaguri (2020), assumes that it is not possible to expand the representation of women without reviewing the power relations that involve gender hierarchies in the sciences. In this way, a feminist scientific policy that focuses exclusively on the representation of women will not be able to change the issue of gender inequality within scientific communities, as highlighted by the following:

> The concern with gender equality should imply not only the expansion of the hiring and participation of women, but also the transformation of the sexist culture that is also reproduced in this workspace. (Castro & Chaguri, 2020, p. 30, own translation).

One potential avenue for effective integration of this discussion can be the incorporation of interdisciplinary project management teams, including researchers from the humanities, gender, and intersectionality studies as well as researchers from the exact sciences and technological fields, in addition to the need to stress academic and institutional cultures founded on androcentric knowledge production structures.

We point to the importance of creating networks in order to hold meetings at the state level that bring together researchers and others involved in projects for girls in STEM for the exchange of experiences from a context of diversity of approaches, creation of a repository of materials produced that can be shared and replicated, mapping of the primary challenges encountered, and strengthening of initiatives on the subject, and possibilities for expanding funding policies, and project continuity. The importance of forming networks and partnerships has been highlighted in the evaluation of gender policies, strengthening the need for a continuous flow of public provision of project financing (Unbehaum & Gava, 2017; Queiroz, 2018). Despite advances in the theme and the emergence of projects for gender equity in science education, the Brazilian political context in recent years has been regressive in terms of gender policies, with reduced allocations of resources to the sciences – mainly in the humanities –, which has an impact on the projects' reach and continuity.

Based on the coordinators' narratives, four dimensions of the importance of the projects are highlighted: social dimension, formative dimension referring to the training of undergraduates, formative dimension referring to the coordinators, and personal dimension. The social inclusion dimension of the projects gains relevance as they work in socially vulnerable regions and allow young women in basic education to expand their perspectives through the creation of a sense of belonging to academic university spaces. Confronting the students' social vulnerability issues, even if they are not included in the objectives of the programs, produces an important constituent of the projects' results.

Another relevant point is the university's approach to the reality of public schools and school communities, identifying the importance of integrating school administration and students' families into the discussion. The involvement of undergraduates in projects focused on gender equity and scientific dissemination also potentiates the training of future professionals who incorporate these themes into their research, teaching, and community service.

As political scientist Flavia Biroli (2016) argues, the sexual division of labor is a cornerstone that shapes gender hierarchies in contemporary societies. The fundamental implication of this division concerns the scarcity of free time and income for women, and consequently it has a great impact on political participation and decision-making spaces. According to Biroli, the sexual division of labor has a structuring character in gender relations, in that the unequal distribution of responsibility between women and men for domestic and care work "constitute the possibilities for action, insofar as they constrain the alternatives [and] incite judgments that are presented as based on nature" (2016, p. 739, own translation).

The incorporation of the intersection of race and class into the dynamics of the sexual division of labor is fundamental for a broader understanding of the problem, as stated by Lélia Gonzalez (1988) when discussing the specificities of Afro-Latin American feminism. Gonzalez argues that we cannot abstract the pluriracial character of Afro-Latin American societies, and that, when dealing with the sexual division of labor, it is necessary to articulate it with its correspondent at the racial level so as not to fall into abstraction and universalization of the issue.

Based on this reference, in regard to scientific spaces, this division structures the possibilities of action, insofar as it constrains the alternatives of women's choices for different professional careers, and is a central point for understanding the horizontal segregation of gender in university courses. Women are mostly enrolled in courses in the fields of health, well-being, and humanities, areas with lower remuneration and related to traditional gender roles and reproductive work, and men in careers of greater prestige and remuneration, in the exact, technological, and engineering fields.

Policies that focus the debate on gender equity and other social markers of difference in science education indicate a desire for change and the emergence of another social and cultural order that questions the current dominant power structures.

Acknowledgments

We thank the researchers of the MSTEM-RJ network [Mulheres nas STEM-RJ] for their correspondence and contributions throughout the preparation of this research. The first author thanks the Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) for their doctoral scholarship, and Fulbright for the doctoral internship. This study was carried out within the scope of the Instituto Nacional de Comunicação Pública de Ciência e Tecnologia do Brasil, with support from CNPq and Faperj.

References

Akotirene, C. (2019). *Interseccionalidade*. Pólen Produção Editorial.

Biroli, F. (2016). Divisão sexual do trabalho e democracia. *Dados: Revista de Ciências Sociais*, *59*(3), 719-754.

Brah, A., & Phoenix, A. (2004). Ain't I a woman? Revisiting intersectionality. *Journal of International Women's Studies*, *5*(3), 75-86.

Brito, C., Pavani, D., & Lima, P. (2015). Meninas na ciência: Atraindo jovens mulheres para carreiras de ciência e tecnologia. *Revista Gênero*, *16*(1), 33-50.

Carvalho, M. G. de, & Casagrande, L. S. (2011). Mulheres e ciência: Desafios e conquistas. *INTERthesis: Revista Internacional Interdisciplinar*, *8*(2), 20-35.

Casagrande, L. S., & Carvalho, M. G. de. (2014). Relações de gênero nas aulas de matemática: Perceptíveis ou ocultas. *Cadernos de Gênero e Tecnologia*, *8*(31-32), 36-48.

Caseira, F. F., & Magalhães, J. C. (2019). Meninas e jovens nas ciências exatas, engenharias e computação: Raça-etnia, gênero e ciência em alguns artefatos. *Diversidade e Educação*, *7*(especial), 259-275.

Castelfranchi, Y. (2010). Por que comunicar temas de ciência e tecnologia ao público? (Muitas respostas óbvias... mais uma necessária). *Jornalismo e Ciência: Uma Perspectiva Ibero-Americana*, *1*, 13-21.

Castro, B., & Chaguri, M. M. (2020). Gênero, tempos de trabalho e pandemia: Por uma política científica feminista. *Linha Mestra*, *14*(41a), 23-31.

Eccles, J. S. (2015). Gendered socialization of STEM interests in the family. *International Journal of Gender, Science and Technology*, *7*(2), 116-132.

Facio, A., & Fries, L. (1999). Feminismo, género y patriarcado. *Género y Derecho*, 1-28.

Faulkner, W. (2007). Tornar-se e pertencer: Processos de generificação na engenharia. *Cadernos de Gênero e Tecnologia*, *3*(10), 21-32.

Freitas, L. B. de, & Luz, N. S. da. (2017). Gênero, ciência e tecnologia: Estado da arte a partir de periódicos de gênero. *Cadernos Pagu*, (49), Artigo e174908. https://www.scielo.br/j/cpa/a/rfcfBJdYmVPBNSDvtK7nZ8v/abstract/?lang=pt

Fundação Carlos Chagas Filho de Amparo à Pesquisa do Estado do Rio de Janeiro (Faperj). (2021). *Edital n. 09 – Seleção de projetos coordenados por pesquisadores vinculados a instituições de ensino superior e/ou pesquisa sediadas no Estado do Rio de Janeiro, no âmbito do Edital Programa Meninas e Mulheres nas Ciências Exatas e da Terra, Engenharias e Computação.* Faperj. https://siteantigo.faperj.br/downloads/Edital_MENINAS_E_MULHERES_NAS_CI%C3%8ANCIAS_2021.pdf

Fundo Social Elas. (2017). *Gestão escolar para equidade: Elas nas exatas*. http://www.fundosocialelas.org/elasnasexatas/edital/

Galdino da Silva, G., Sinnecker, E., Rappoport, T., & Paiva, T. (2020). Tem menina no circuito: Dados e resultados após cinco anos de funcionamento. *Caderno Brasileiro de Ensino de Física*, *42*, Artigo e20200328. https://www.scielo.br/j/rbef/a/GWqTnyhS3zbXY3BF8Hqgvfy/abstract/?lang=pt

Garcia, M. I. G., & Sedeño, E. P. (2006). Ciência, gênero, tecnologia. In L. W. dos Santos, E. Y. Ichikawa, & D. de F. Cargano (Orgs.), *Ciência, tecnologia e gênero: Desvelando o feminino na construção do conhecimento* (pp. 33-72). Iapar.

Gonzalez, L. (1988). A categoria político-cultural de amefricanidade. *Tempo Brasileiro*, *92*(93), 69-82.

Guedes, M. de C., Azevedo, N., & Ferreira, L. O. (2015). A produtividade científica tem sexo? Um estudo sobre bolsistas de produtividade do CNPq. *Cadernos Pagu*, (45), 367-399.

Haraway, D. (1995). Saberes localizados: A questão da ciência para o feminismo e o privilégio da perspectiva parcial. *Cadernos Pagu*, (5), 7-41.

Harding, S. (1993). A instabilidade das categorias analíticas na teoria feminista. *Revista Estudos Feministas*, *7*(1), 7-31.

Herrera, S. B., & Spinelli, P. F. (2019). Girls of today and women from the past: When the history of female scientists is used to engage girls with science. *Transversal: International Journal for the Historiography of Science*, (6), 35-48.

Herrera, S. B., Spinelli, P. F., & Germano, A. P. (2018). Inclusão pela ciência: O caso do projeto Meninas no Museu de Astronomia e Ciências Afins (MAST). In *Anais do 11 Seminário Internacional Fazendo Gênero & 13 Women's Worlds Congress*. Florianópolis. http://www.en.wwc2017.eventos.dype.com.br/resources/anais/1503617269_ARQUIVO_BenitezHerreraSandra-MeninasNoMuseu.pdf

hooks, b. (2018). *O feminismo é para todo mundo: Políticas arrebatadoras.* Rosa dos Tempos.

Kergoat, D. (2009). Divisão sexual do trabalho e relações sociais de sexo. In H. Hirata, F. Laborie, H. Le Doaré, & D. Senotirer, *Dicionário crítico do feminismo* (pp. 67-75). Editora da Unesp.

Lazarides, R., & Ittel, A. (2013). Mathematics interest and achievement: What role do perceived parent and teacher support play? A longitudinal analysis. *International Journal of Gender, Science and Technology*, *5*(3), 207-231.

Leaper, C. (2015). Do I belong?: Gender, peer groups, and STEM achievement. *International Journal of Gender, Science and Technology*, *7*(2), 166-179.

Lima, B. S. (2013). O labirinto de cristal: As trajetórias das cientistas na Física. *Revista Estudos Feministas*, *21*(3), 883-903.

Lima, B. S. (2017). *Políticas de equidade em gênero e ciências no Brasil: Avanços e desafios* [Tese de Doutorado]. Universidade Estadual de Campinas, Instituto de Filosofia e Ciências Humanas. https://repositorio.unicamp.br/Acervo/Detalhe/983803

Lima, B. S., & Costa, M. C. da. (2016). Gênero, ciências e tecnologias: Caminhos percorridos e novos desafios. *Cadernos Pagu*, (48), Artigo e164805. https://www.scielo.br/j/cpa/a/ZmWr68DQZSFH3wp9MWSB79t/abstract/?lang=pt

Lombardi, M. R., Silva, U. V., & Mercado, C. M. (2016). *Por que tão poucas? Um estado da arte dos estudos em engenharia e gênero* (Textos FCC. Relatórios Técnicos, 49). Fundação Carlos Chagas.

Maciel, C., & Bim, S. A. (2016). Programa Meninas Digitais: Ações para divulgar a computação para meninas do ensino médio. In *Computer on the Beach* (pp. 327-336). Itajaí, SC.

Marotti, J., Campos, F., Godinho, J., SantClair, G., Villela, F., Gomide, J., Oliveira, L. E. de, Becker, B., Laricchia, C., Siloto, D., Rocha, E., Estanislau, M., Martins, T., & Belmonte, V. N. (2021). Incentivando meninas nas ciências: Um relato de experiência dos minicursos de programação e robótica para jovens. In *Anais do 15 Women In Information Technology* (pp. 300-304). Porto Alegre.

Melo, H. P. de, & Thomé, D. (2018). *Mulheres e poder: Histórias, ideias e indicadores*. Editora FGV.

Ministério da Ciência, Tecnologia e Inovação. Conselho Nacional de Desenvolvimento Científico e Tecnológico (MCTI/CNPq). (2013). *Chamada n. 18/2013 – MCTI/CNPq/SPM-PR/Petrobras – Meninas e Jovens Fazendo Ciências Exatas, Engenharias e Computação*. MCTI/CNPq/SPM-PR/Petrobras. http://memoria2.cnpq.br/web/guest/chamadas-publicas?p_p_id=resultadosportlet_WAR_resultadoscnpqportlet_INSTANCE_0ZaM&idDivulgacao=4341&filtro=encerradas&detalha=chamadaDetalhada&id=47-227-2064#void

Ministério da Ciência, Tecnologia e Inovação. Conselho Nacional de Desenvolvimento Científico e Tecnológico (MCTI/CNPq). (2018). *Chamada CNPq/MCTIC n. 31/2018 – Meninas nas Ciências*

Exatas, Engenharias e Computação: Apoiar projetos que visem contribuir significativamente para o desenvolvimento científico e tecnológico e a inovação do País, por meio do estímulo à participação e à formação de meninas e mulheres para as carreiras de ciências exatas, engenharias e computação. MCTI/CNPq. http://memoria2.cnpq.br/web/guest/chamadas-publicas?p_p_id=resultadosportlet_WAR_resultadoscnpqportlet_INSTANCE_0ZaM&id=47-1198-5840&detalha=chamadaDetalhada&filtro=encerradas

Oliveira, E. R. B. de, Unbehaum, S., & Gava, T. (2019). A educação STEM e gênero: Uma contribuição para o debate brasileiro. *Cadernos de Pesquisa*, *49*(171), 130-159.

Ong, M., Smith, J. M., & Ko, L. T. (2018). Counter-spaces for women of color in STEM higher education: Marginal and central spaces for persistence and success. *Journal of Research in Science Teaching*, *55*(2), 206-245.

Peregrino, G., Massone, C., Nudi, A., & Saint Pierre, T. (2021). Hair mineralogram analysis for health assessment: Statistical bias from gender and aesthetic treatments. *Brazilian Journal of Analytical Chemistry*, *8*(33), 71-88.

Piscitelli, A. (2008). Interseccionalidades, categorias de articulação e experiências de migrantes brasileiras. *Sociedade e Cultura*, *11*(2), 263-274.

Queiroz, C. T. A. P. de. (2018). *Avaliação de um programa para inclusão de meninas em STEM na Paraíba-Brasil: Articulação entre o Ensino Médio e o Superior* [Tese de Doutorado]. Universidade Federal da Paraíba, Programa de Pós-Graduação em Educação. https://repositorio.ufpb.br/jspui/handle/123456789/15381?locale=pt_BR

Quirino, R., Tonini, A. M., Lombardi, M. R., Casagrande, L. S., Holanda, K. M. A., Lima e Souza, A. M. F., Guarnier, C. R. F., Tomé, F., Nascimento, B. X. M., & Cabette, R. E. S. (2018). Mulheres na engenharia: Desafios e possibilidades. In A. M. Tonini, & T. R. D. S. Pereira (Orgs.), *Desafios da educação em engenharia: Inovação e sustentabilidade, aprendizagem ativa e mulheres na Engenharia* (pp. 192-221). Abenge.

Rossiter, M. W. (1993). The Matthew Matilda effect in science. *Social Studies of Science*, *23*(2), 325-341.

Sardenberg, C. M. B. (2002). Da crítica feminista à ciência a uma ciência feminista? In A. Costa, & C. M. B. Sardenberg, *Feminismo, ciência e tecnologia* (pp. 89-120). Redor/NEIM-FFCH/UFBA.

Schiebinger, L. (2001). *O feminismo mudou a ciência?* Edusc.

Schiebinger, L. (2008). Mais mulheres na ciência: Questões de conhecimento. *História, Ciências, Saúde-Manguinhos*, *15*, 269-281.

Sequeira, S. C. M., Silva, L. L., Nascimento, E. B., Kelly, M. S., Silva, F. A. N. G., & Teixeira, V. G. (2021). Meninas na química: Discutindo questões de gênero no ensino de química a partir de atividades lúdicas aliadas à experimentação. In *Anais do 4º Encontro Nacional de Jogos e Atividades Lúdicas no Ensino de Química, Física e Biologia*. Rio de Janeiro.

Spinelli, P. F., Herrera, S. B., & Germano, A. P. (2019). Towards gender equality: Girls' day at the Museum of Astronomy and Related Sciences. *Communicating Astronomy with the Public Journal*, *25*(23), 23-27.

Teixeira, V. G., Silva, L., Sequeira, S. C. M., & Silva, F. A. N. G. (2021). Contribuições da ludicidade na desconstrução do currículo oculto masculinizado. In J. F. M. da Silva (Org.), *O lúdico em redes: Reflexões e práticas no ensino de ciências da natureza* (pp. 145-174). Editora Fi.

Unbehaum, S., & Gava, T. (2017). Avaliação das iniciativas do edital Elas nas Exatas. In *Anais do 11 Seminário Internacional Fazendo Gênero & 13 Women's Worlds Congress.* Florianópolis. http://www.en.wwc2017.eventos.dype.com.br/resources/anais/1499387024_ARQUIVO_cod_5462827_ST067sessao1_UnbehaumS_GavaT.pdf

United Nations Educational, Scientific and Cultural Organization (Unesco). (2019). *Women in science* (UIS Fact Sheet, 55). Unesco Institute for Statistics.

Viana, V. J. (2021). *Igualdade de gênero: Projeto Meninas e Mulheres na RRD*. https://drive.google.com/file/d/1LVQwMp2nO92eHRkZhrJ2rthDsr2RM-Jv/view

Witovisk, L. C., Carvalho, L. B., Costa, A. F., Guedes, E., Zucolotto, M. E., Trindade, V., Souza, T., Sá, N. P., Boas, S. N. V., Maciel, B. S.; Cabral, U. G., Paula. P. J. G., & Nunes, S. (2018). Curso de Extensão "Meninas com Ciência": Potencialidades da Divulgação da Geologia e Paleontologia na Perspectiva de Gênero. *Anuário do Instituto de Geociências*, *41*(2), 233-240.

Note on authorship

The first author contributed to the design, data collection, analysis, and writing of the manuscript. The second author contributed to the design and revision of the manuscript.

Data availability statement

Data related to the mapping of initiatives are widely available on the internet, and the systematization of data carried out by the authors can be made available on demand. However, data referring to the transcription of the interviews with the coordinators cannot be made available due to the guarantee of anonymity in the Free and Informed Consent Term signed by the respondents.

How to cite this article

Reznik, G., & Massarani, L. (2022). Mapping and importance of projects for gender equity in STEM education. *Cadernos de Pesquisa*, *52*, Article e09179. https://doi.org/10.1590/198053149179_en

Appendix

Appendix 1

Description of projects funded by the CNPq program Meninas nas Ciências Exatas, Engenharias e Computação no estado do Rio de Janeiro

Project name	Coordinating institution	Coordinators' area of expertise	Gender of coordinators	Financing (public funding)	Project start date	Scientific production[2]
Tem Menina no Circuito	Universidade Federal do Rio de Janeiro	Physics	Female	CNPq n. 18/2013; Elas nas Exatas I	2014	Galdino da Silva et al., 2020
Estudo de viabilidade infraestrutural de rede de drenagem urbana no município de Carmo na região serrana do estado do Rio de Janeiro	Centro Universitário Serra dos Órgãos	Agronomy	Female	CNPq n. 18/2013	2014	
Produção orgânica no município de Seropédica: avaliação de sua sustentabilidade e o seu impacto nos atributos físicos, químicos e biológicos do solo	Universidade Federal Rural do Rio de Janeiro	Agronomy	Male	CNPq n. 18/2013	2013	
Incentivando a formação na área de ciências exatas e engenharia de jovens alunas do município de Macaé	Universidade Federal do Rio de Janeiro	Physics	Female	CNPq n. 18/2013	2014	

(To be continued)

2 Based on the works published on the Plataforma Lattes profile of the coordinators in the categories "complete articles", "published book chapters" and "complete works published in proceedings of conferences" until November 2021.

(Continuation)

Project name	Coordinating institution	Coordinators' area of expertise	Gender of coordinators	Financing (public funding)	Project start date	Scientific production
Invadindo o universo feminino com ciência – cosméticos como tema motivador para a inserção de meninas na Química	Universidade Federal do Rio de Janeiro	Chemistry	Female	CNPq n. 18/2013	2013	Teixeira et al., 2021; Sequeira et al., 2021
Meninas digitais na Baixada Fluminense	Universidade Federal Rural do Rio de Janeiro	Compunting	Female	CNPq n. 18/2013; CNPq n. 31/2018	2013	
Utilizando o Arduino como ferramenta para estimular conhecimentos de eletrônica e programação	Instituto Federal de Educação, Ciência e Tecnologia do Rio de Janeiro	Physics	Male	CNPq n. 18/2013	2014	
Transformando meninas em futuras cientistas brasileiras por meio da integração entre o IFRJ e as escolas públicas do município de Duque de Caxias	Instituto Federal de Educação, Ciência e Tecnologia do Rio de Janeiro	Chemistry	Female	CNPq n. 31/2018	2018	
Meninas e mulheres na RRD: ciência, tecnologia e educação para a redução de riscos de desastres socioambientais	Centro Universitário Augusto Motta	Environmental Engineering	Female	CNPq n. 31/2018	2018	Viana, 2021
Meninas olímpicas do IMPA	Instituto Nacional de Matemática Pura e Aplicada	Mathematics	Female	CNPq n. 31/2018	2018	
Apaixonadas por STEM	Universidade Federal do Rio de Janeiro	Mathematics	Female	CNPq n. 31/2018	2018	
Meninas nas ciências exatas da Baixada Fluminense: dos laboratórios da UFRJ ao Museu Ciência e Vida	Universidade Federal do Rio de Janeiro	Physics	Female	CNPq n. 31/2018	2018	
Meninas no Museu de Astronomia e Ciências Afins	Museu de Astronomia e Ciências Afins	Astrophysics	Female	CNPq n. 31/2018	2016	Herrera et al., 2018; Herrera & Spinelli, 2019; Spinelli et al., 2019
Meninas na Robótica	Centro Federal de Educação Tecnológica Celso Suckow da Fonseca	Computing	Female	CNPq n. 31/2018	2018	Quirino et al., 2018
Estudo estatístico da composição química do cabelo	Pontifícia Universidade Católica do Rio de Janeiro	Chemistry	Female	CNPq n. 18/2013; CNPq n. 31/2018	2013	Peregrino et al., 2021
Ampliando os olhares na região Norte Fluminense para o relevante papel das mulheres em ciências exatas, da computação e engenharia	Universidade Federal do Rio de Janeiro	Production Engineering	Female	CNPq n. 31/2018	2018	Marotti et al., 2021

Source: Authors' elaboration with research data.