

Forum theatre as a tool to unveil gender issues in STEM working environment

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Abstract

Gender affects all aspects of life, and the working and learning environment of science, technology, engineering and geosciences presents no exception. Gender issues concerning access, permanence and ascension of women in exact and earth sciences careers in general, are related to a variety of causes. The underrepresentation of women in science communications, sexual or moral harassment caused by professors and colleagues during undergraduate and graduate ages, or the overload of housework for girls, when compared to boys, during early school ages are some examples mentioned in the literature. In other words, gender imbalance in science and technology careers may be seen as the result of a series of structured oppression suffered by women of all ages. In this context, we propose the development of an education package designed to understand these processes at different levels. One of the tools of this package is known as the Theatre of the Oppressed. Elaborated by Augusto Boal in the 1970s, the Theatre of the Oppressed uses theatre techniques as means of promoting social and political changes. Usually, a scene takes place, revealing an oppression situation. The audience becomes what is called “spect-actors”, where they become active by exploring, showing, and transforming the reality in which they are living. In the context of gender issues in exact sciences careers, the students can stage situations that reveal subtle actions of power relations that usually put women in subservience places. Our experience showed that even though the acting is fiction, the spectators learn much from the enactment, because the simulation of real-life situations, problems, and solutions stimulates the practice of resistance to oppression in reality, within a condition that offers a “safe space” for practising making a change.

1 Introduction

The academic and pedagogical scenario related to STEM fields (science, technology, engineering and mathematics) still present asymmetries when observing gender issues. Science represents a field of

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disputes, in which different axes of subordination intertwine (Crenshaw, 1991; Minella, 2013), and the experiences of subjects termed as women are distinct from those experienced by men. The studies that bring the theme of gender and science in Brazil begins in the mid-70, with the second feminist wave. The relevance attributed to this theme was made remarkable in 1990 when de Melo and Oliveira (2006) pointed out the absence of women throughout the history of science in the country. Currently, the research and actions related to gender and STEM have the collaboration of different institutions (academia, government, NGOs, spaces of formal education) to problematise, analyse and propose actions that can restructure and assign new meanings to science.

STEM fields, in particular the geosciences, are relevant fields to environment and economy, from local to global scales, from which research results may affect a variety of bodies and lives. But in contrast, STEM are of the least diverse fields (Holmes, 2008; Nentwich, 2010; Marin-Spiotta et al., 2020). To better understand the existing asymmetries within important science disciplines related to gender, one might refer to issues regarding the distinctions between taste and learning throughout basic education; the insertion of women in science courses; persistence in academia; and professional advancement of men and women.

The worldwide scenario analysed by the United Nations Educational, Scientific and Cultural Organisation (UNESCO, 2017) highlights significant advance in girls' participation in education, bringing emphasis to higher education. In assessing the presence and permanence of girls in primary education, despite increased access in many contexts, socioeconomic and cultural barriers still make it difficult or impossible for students to complete and benefit fully from the good educational quality of their choice. During primary education, when children are already exposed to science and math content, gender role stereotypes are already present (Leslie et al., 2015; Dickhäuser and Meyer, 2006). Teachers report that, in evaluations, they have different expectations regarding learning in science and math for girls and boys (Dickhäuser and Meyer, 2006). The boundaries imposed by stereotypes are widened during adolescence, when gender roles become more entrenched for girls, including domestic and care responsibilities, the possibility of early marriage and pregnancy, and cultural norms that prioritise boys' education. These boundaries imply in higher rates of girls losing interest in STEM subjects with age (UNESCO, 2017; Sylvia et al., 2008).

By analysing the situation of adults, women leave the STEM sector at much higher rates than men. Women represent 30% of researchers in STEM around the world, against to 53% of the world's bachelor's and master's graduates in the field. This gap varies from country to country due to different sociocultural facts (UNESCO, 2017). The leaky pipeline in STEM careers represents a waste of social investment and individual effort and suggests that there are structural problems around this scenario. The gender gap in STEM fields is undoubtedly a complex issue, especially when considering intersectionality aspects such as race, class or global scale cultural variations (Crenshaw, 1991). These data, while considering

the specificities of each country and region, still show the persistence of a pattern: men are destined for areas popularly known as challenging or difficult within STEM. The entrance and perseverance of women in geosciences are permeated by multiple symbolic references, implicit or not, that mark the limits of how far it is possible to go within the power structure represented by science.

The underrepresentation of girls and women in STEM fields is a complex (Reinking and Martin, 2018) and worldwide phenomenon (Stoet and Geary, 2018). The subject is treated into vertical and horizontal aspects, where vertical refers to advancement steps in career, while horizontal aspects represent societal structural constructions. Vertical segregation is usually represented by some metaphors, such as the *leaky pipeline* (Lima, 2013; Grogan, 2019), that depicts women passively leaking out of STEM careers, revealing a waste of feminine potential and public resources. Another famous metaphor is the *scissors diagram* (Neugebauer, 2006), which is a plot of the percentage of men and women holding pre-doctoral, post-doctoral, junior group leader, and professor positions, that in most countries shows a steady decline for women as career stages advance, while the corresponding curve for men arises. The intersection between the lines generates a figure similar to a scissor, which refers to the effect of women being “scissored out” of STEM careers. Finally, the *glass ceiling* (Rosser, 2004; Amon, 2017) or *crystal maze* (Lima, 2013) metaphor refers to the specific obstacles faced by women along their career paths. Lima (2013) argues that the image of the maze marks diversity and multiple barriers along the female trajectory, and the crystal transparency refers us to the obstacles faced by these women, that at least in Brazil, are not formal, but exist.

The literature on the causalities of the STEM gender gap is today large and growing. Well-known issues that constrain women participation in science, such as housekeeping and motherhood, are largely documented. An interesting study from Abouzahr et al. (2017) showed that having children does not make women less ambitious for career achievements. Instead, they demonstrated that women start their careers with as much ambition as men—or more, but an ambition gap occurs when women work in companies where employees of both genders report low progress on diversity values. More and more research reveals that the subtle ways of privileging a certain body in a devaluation of another make up an important structure of the gender imbalance scenario. Women are also less likely to receive prizes and awards and are less invited to conference talks (Holmes et al., 2011; Ford et al., 2019; Holmes et al., 2020). Besides, King et al. (2018) have shown that women and other minorities often experience a feeling of not belonging when attending scientific conferences, due to the accumulation of largely subtle behaviour and interactions during their talks, and to an established behaviour code that often privileges white researchers and men. In the geosciences, fieldwork culture usually extols masculine strength and resistance (Carey et al., 2016), and it is not uncommon the lack of infrastructure for women on ships or proper accommodation in field trips (Holmes, 2008), which promotes a feeling of “not welcoming”. Chilly climates in some departments and institutions are frequently reported (Holmes, 2008; Amon, 2017;

Marin-Spiotta et al., 2020). In trajectories analyzed by physics students, for example, they emphasised the solitary path within the academic life (Lima, 2013), and Amon (2017) highlights the importance of spaces for socialization among women.

It is a common-sense in the literature that education is crucial for reducing gender inequality, but the strategies may vary. We consider that emphasis on reducing the gender gap in strategical areas, such as geoscience courses, is crucial. The gender gap is measured globally by the World's Economic Forum in four key areas: economic participation and opportunity, educational attainment, health and survival, and political empowerment (Forum, 2020). According to the 2020 Global Gender Gap index (Black, 2020), it will take us nearly 100 years to achieve gender parity. Today, 55% of working-age women are in the labour market, against 78% of men. This gap is being narrowed in the last decades, and having more women exerting economic activities outside the home usually translates into better-improved health, reduced domestic violence for girls and women, and more significant economic growth for the society as a whole. But according to the World's Economic Forum report (Forum, 2020), if we consider the fastest growing professions of the future, a critical data reveals a problematic situation: women form only 26% among people with artificial intelligence and data skills, 15% among people with engineering skills and 12% among those with cloud computing skills. The inclusion of young girls in Science, Technology, Engineering and Mathematics (STEM) courses is thus an important key to embed gender parity and to prevent a setback against women's access to labour market rates.

While some works show that there are no gender differences between girls and boys skills in math (Kersey et al., 2018), it is widely investigated that girls and women are more concerned than boys with their teachers, parents and mentors evaluation (Aiken and Dreger, 1957; Dickhäuser and Meyer, 2006; Ginther and Kahn, 2015). Some elements can influence the permanence of women in STEM courses, including the inspiration and support of close and influential people, such as family members and teachers (de Amorim et al., 2017). By staying in the chosen academic path, the construction of the career is also permeated by systems of oppression and power (Marin-Spiotta et al., 2020). Factors that influence women's permanence in careers in STEM include the compatibility that is perceived between specific STEM fields with female identity, compatibility with family obligations, and with the environment and working conditions. In short, it seems settled that subtle issues and structured behaviours matters concerning gender gaps in the STEM field.

On the other hand, it is not straightforward dealing with emotional aspects, such as low self-esteem or pointing out a particular behaviour. According to Renki (2018), communicating to someone that they are sexist usually doesn't work. Besides, there are multiple ways to stereotype different social groups, and tracing how someone is treated based on particular characteristics is a tricky task.

Bleuer et al. (2018) argue that the capacity of the theatre of capturing and communicating relational aspects are beneficial for knowledge mobilization. In a psychological point of view, theatre enables

audience members to cultivate greater empathy for the issues witnessed on stage. The usage of verbal and nonverbal communication allows a level of engagement with the audience of cognitive and emotional aspects, which promotes the perfect environment to understand the complex dynamics that permeate gender issues in academia. Forum Theatre (Boal and McBride, 2013) is historically used by social movements. Still, it is also being used by researchers and policymakers to communicate science and to discuss problems in a contextualised way (Burgoyne et al., 2007; Shanley and López, 2009; Strickert and Bradford, 2015). In particular, theatre is an incredible tool to gender issues in science mobilization. Taking into account that beyond explicit violence and harassment against women, subtle violence (and violent legal acts) are understood with empathy through theatrical shows, which doesn't necessarily happen through direct presentations or reports.

The present study applies a method designed to promote a positive environment towards gender diversity in the various contexts that permeate the university, including its access and permanence of graduate and undergraduate students, the gender-biased relations between professors, students and technicians, and the superior management policies. We adapted to educational contexts an arts-based mobilisation tool to overcome self-expression barriers, focused on a highly diverse public, including high school students from public schools, natural sciences students from the University of Brasilia, professors and researchers. We perceived that political theatre, in combination with mainstream communication strategies, has the capacity of reaching the attention of the university top management on gender issues within all the discussed sectors. The goals of this article, then, are to describe one method of:

1. communicating about university access among different groups, focusing on gender issues
2. bringing gender issues discussions into the university community (faculty, staff and students) avoiding direct conflicts
3. publicise the work of female scientists
4. provide a safe place to promote discussions and to empower female students

We will present the results from the actions promoted in the implementation of an extension project at the University of Brasília. Our analysis is based on qualitative methods to assess the interactive and political theatre performance's impact. This work has practical implications for companies, schools and universities managers and research coordinators, by describing a project that aims to foster gender parity by promoting self-understanding, revealing social structures and unveiling myths.

1.1 The subjects

The University of Brasilia is the 4th most prominent university in Brazil (LLC, 2015) and its resources are distributed between four camps. Planaltina Campus (FUP) was implemented before the Federal Gov-

ernment’s higher education expansion program. The Planaltina Campus corresponds to the region that aggregates Planaltina, Sobradinho, Brazlândia, Sobradinho II, Formosa, Buritis, Cabeceiras, Planaltina de Goiás, Vila Boa and Água Fria de Goiás, and it was officially inaugurated on May 16, 2006, with 70 students enrolled in the Natural Sciences Licensing and Bachelor of Agribusiness Management courses, with ten PhD professors.

FUP has existed for 14 years, being conceived in a plan of decentralization of the University infrastructure. The campus is situated 40 km away from the main campus, in a city of a mainly low-income population, surrounded by rural areas, including large estates and smallholdings. The city’s economy is based on agriculture, and therefore most of the jobs offered in the region are in some way linked to agribusiness management. This fact led to the opening of four undergraduate courses: natural sciences licensing, peasant education, agribusiness and agroecology management, that are somehow related to earth sciences, in which at least introduction to geosciences is offered regularly as a mandatory course. Together, these courses provide today 420 annual chairs for higher education, including diurnal, nocturnal and full shifts courses. The campus also houses seven graduate courses: Environmental Sciences (master’s and doctoral degree), Materials Science, Science Teaching, Public Management, Water Resources Management and Regulation, Environment and Rural Development, and Sustainability with Traditional Peoples and Territories (master’s degree).

Table 1: Proportion of male/female entrance, graduation and dropout rates at Planaltina campus, divided for each undergraduate course: natural sciences licensing daytime (CNN) and nighttime (CND), teaching degree in peasant education (LEDOC), environmental management (GAM) and agribusiness management (GEAGRO)

	Total		CNN		CND		LEDOC		GAM		GAM	
	M	F	M	F	M	F	M	F	M	F	M	F
Students entering FUP	45.9	54.1	46.2	53.0	41.6	58.4	38.6	61.4	50.1	49.9	53.3	46.7
Graduated students	39.7	60.3	36.9	63.1	36.7	63.3	30.2	69.8	43.1	56.9	47.1	52.9

According to data extracted at the beginning of 2020, we can see that the Planaltina campus follows the gender gap found in the literature from data on student enrollment and graduation in all courses. Table 2 shows that in three courses of FUP - natural sciences licensing daytime (CNN) and nighttime (CND), and the teaching degree in peasant education (LEDOC) the entry of female students is higher. These courses are degree courses for teacher training, which is a profession usually attached to women. Therefore the entrance of 54% women is expected. In the other two courses, environmental management (GAM) and agribusiness management (GEAGRO), we observe a slightly male predominance at the entrance and a reversal of the pattern for graduation rates. Women are the ones who graduate most in all FUP courses, with a total of 60.3%, but in the peasant education course it reaches 69.8%, and in the courses with the highest number of men, the index graduation rates for women reaches 56.9% and 52.9%, increasing the proportionality with the entrance and raising the total graduation rate. The

economic reports, though, show that these women do not achieve visibility even with higher earnings in graduation.

These data are following the studies made by Pereira (2015), who affirm that women are the majority at all education levels in Brazil, including superior, and even though the courses with the most predominance of them are those considered as typically female, in the total, they are still the majority. Guedes (2008) made a study about the female presence in university graduate and undergraduate courses. She affirms that the analysis of last IBGE census studies reveals that in thirty years women succeeded in reversing the historical inequality and consolidate a new reality in which they are the majority (60%) of the graduates among the youngest, which is consistent with Planaltina Campus numbers.

Brazilian Federal Constitution states that the university is characterised by the inseparability of teaching, research and extension. Here, we refer to the university extension as an interdisciplinary, educational, cultural, scientific and political process that promotes transformative interaction between the university and other sectors of society. Through extension actions, it is possible to promote social inclusion and promote wider dissemination of knowledge.

Planaltina campus is the most engaged campus with the population that surrounds the university. It has more than 60 extension projects and programs, led by the campus professors, staff and students, which promote social activities, engaging the population and academia research. From those, at least three projects use political theatre as a tool to disseminate research findings, organise groups and capture and communicate knowledge about social relationships. The Terra em Cena program is one of FUP's extension programs to promote articulated actions between teaching, extension and research (Boas et al., 2019). The program exists since 2010 with the scope of theatrical and audiovisual language, acting mainly with students from the Peasant Education undergraduate. Thus all the participants of the program are deeply involved with peasant communities and settlements, often linked to social movements, or are part of the Kalunga quilombola territory (Gomide et al., 2019).

1.2 The project

The present work describes the results achieved with the project “Mulheres cientistas: desafios, mitos e resistência cotidiana”, from Portuguese “Scientist women: challenges, myths and daily resistance”. The project exists since the beginning of 2019, structured in teaching and communicating activities. In this manner, we offer a set of laboratory routines for high school students, with activities based on women's work, to promote representativeness and to rescue hidden figures of science history. The project also facilitates a regular study group, that asks the participants to think about data, structural issues and to study feminist texts. And finally, we invite the public to feel how a scientist feels, how a woman feels, how relations are posed, using strategies from the popular theatre. The theatre-based activities are co-conducted with the extension program Terra em Cena.

Part of Terra em Cena’s activities involves action in the Brazilian capital equivalent to what is being done in the capitals of Argentina and Uruguay. The orientation of the International Network of Theater and Society (Boas et al., 2019) is for opening new training schools in political, audiovisual and arts, to offer political formation in the countryside and the city, articulated with social movements.

The provision of politicization of the experience through the Theatre of the Oppressed and the contact with Brazilian dramaturgy that addresses issues of interest to the rural population enables the nexus between aesthetic and political formation and the community’s social organisation process. In the teaching degree program in Peasant Education, the work of the Terra em Cena Program collaborates with the promotion of multiple literacies (Freire and Macedo, 1987), by adding linguistic studies, written literacy, grammar and literature, to theatrical and audiovisual languages.

The ability of the theatre for capturing and communicating knowledge about social relationships in ways that are not always possible through texts (Bleuer et al., 2018), makes the Terra em Cena program an articulator of interdisciplinary activities.

Throughout the Terra em Cena experience, the theme of patriarchy and feminism has been one of the main topics in the theatre plays and audiovisual products of the groups that emerged from its performance. In this context, the participants of the project Mulheres Cientistas approximated to the theatre activities promoted by Terra em Cena. To explain and discuss ways to foster gender imbalance in its most diverse perspectives, with an emphasis on the particularities of exact and earth sciences, we put on the scene a set of theatrical and/or audiovisual sketches based on commonly denounced situations of harassment in this environment.

1.3 The theatre of the oppressed

The theatre of the oppressed is the name that Augusto Boal gave to his systematization of theatre techniques as means of promoting social and political changes (Boal and McBride, 2013). The scenes usually aim to reveal oppression situations, and the audience takes place into the scene in active ways, becoming what is called “spect-actors”. The spect-actors transform the reality in which they are living by exploring and changing the scene. A major concept of the theatre of the oppressed is that it is not enough to interpret the reality; it is necessary to transform it. We used two techniques from the theatre of the oppressed in the project: the invisible theatre and the forum theatre.

The invisible theatre is a form of acting that the audience doesn’t necessarily know that a scene is taking place. It is possible to present an invisible show anywhere the drama could really happen or has already occurred (for example, in a laboratory, a meeting, a conference presentation or a cafe). It is an interesting form of organisation since there are no explicit spatial (auditorium and stage) or personal (actors and audience) hierarchic configuration. The key in an invisible theatre intervention is its political effectiveness, by revealing contradictory dynamics through a scene represented with reality. To this end,

it is necessary to develop the aesthetic effect of the scene.

According to Boas (2019), a successful invisible show must follow some basic rules, such as "Actors should never commit any act of violence against or intimidate spectators - their actions must always be peaceful, as they are revealing the violence of society as it exists, not duplicating it", "the scene must be as theatrical as possible, and must be able to unfold even without the participation of the spectators" or "One should never perform an illegal act since the aim of the invisible theatre is precisely to question and challenge the legitimacy of legality." The invisible theatre demands particular efforts on rehearsing not only the predicted scene but also any possible or predictable interventions by future spectators.

As the invisible theatre, the forum theatre also aims to make oppression visible, but in this arrangement, the scene is explicit, and the show acts as a forum to help people understand how they can change their world. Audience members become actors in crucial moments of the proposed scene, directing the way the play reaches its climax through changes on the specific behaviour of a character, or by modifying a given configuration.

In this sense, our group developed some scenes based on the invisible theatre, that are performed during public talks at the university, or during our science labs to students, revealing micro and macro sexist situations, especially in academic environments. The performs usually have a silent impact, that can be noticed on a general change of behaviour from participants and spectators, which reveals a level of empathy that grows from the act. We also developed forum theatre scenes, from where we noticed particular challenges, that comes from the fact that forum theatre deals with an immediate intervention from the audience.

A known experience of feminist theatre is the group led by Muriel Naessens, in France, Feminism-enjeux (Ferré, 2019). What we get from our experience and Ferré (2019) report on Feminism-enjeux issues, is that violence against women, especially subtle violence, accepted socially, is that in forum theatre experiences, is not uncommon that the spect-actor brings to the stage solutions based on the empowerment of the oppressed woman solely, as if the victim was also the responsible for its own oppression. Thus some interventions are made necessary, to guarantee that the concept of private violence is a public concern is well understood by all participants. In other words, the participants must be aware that only collective action, legislative innovations and public policies truly transform reality.

1.4 Creating the play

In the scope of the project "Mulheres cientistas", we used forum or invisible theatre for each presented context. At schools activities and workshops offered at the university, we used forum theatre schemes to promote particular discussions brought up by the workshop participants. We used the invisible theatre in public situations at the university, such as presentations of projects to colleagues or management meetings. The scenes were elaborated and performed by professors and students. The studies groups

were useful to collect data, information and thoughts to base the script and to predict possible reactions.

One of the ways to achieve the project's objectives is to reveal structural gender oppressions, which are not necessarily directly connected to the academy, but which necessarily influence academic paths. Intrinsic paternalism culture makes it difficult to perceive harassment situations to which all women are subjected in daily life, that can happen in a simple trip to the supermarket, a business meeting, a college class or a domestic situation. The idea of portraying some scenes was to get in touch with these situations revealing different scales and levels of the consequences of this social structure.

The first elaborated scene brings a clipping of a family that presents a woman, mother of two pre-teens, researcher and wife. The scene also features another woman, the housekeeper and nanny of this family, who is also the mother of a girl.

The scene begins with the tired researcher of a sleepless night working on a project, and dealing with the two children who stay on the cell phone all the time and argued tirelessly. At that time the housekeeper arrives, but she was late because she wasn't able to take the transport on time due to precarity conditions of public transportation.

At this point, the housekeeper reported that the only alternative to get to work after a long wait was to take a crowded transport and that she felt intimidated and afraid of suffering sexual harassment in the bus, a common situation when the bus is crowded.

The scene continues with the housekeeper taking care of the house, the chaos that was the relationship of children while the researcher finishes her project with a new coffee. The housekeeper's daughter calls her asking for material to school, and she responds, saying that there is no way to buy it because she will come late from work. The scene has the intention to show the contradictions of the relations of these two women. They confide their difficulties at work and in life. One has spent all night working on the project that has not even finished, and the children do not rest until the housekeeper would arrive and take care of them. The housekeeper, on the other hand, is barely able to get to work because of the transportation in which she is likely to be harassed, she goes to work all day caring for her mistress's things and children but will not have time to take care of her own daughter's demands. It is a relationship that could, for some, be seen as a complicity relationship, but which in many ways, shows contradictions.

In another part of the scene, the researcher has a clash with her daughter, who needs to get ready to go to swimming class. The mother asks her daughter to wear a more "well-behaved" outfit because the girl is wearing shorts and a low-cut tank top so someone could harass her. And the fight revolves around the mother wanting to preserve the daughter from harassment and the daughter to defend the right to dress like this because it would be sweltering (Minella, 2013; Lima, 2013).

The second part of the scene shows the researcher talking on the phone with her husband. In the call, he says that he can pick up the girl in the swimming class that day, which makes she feels relieved and grateful that he will be able to finish the late work she was doing. For a moment, within the reflection

of the character, she is extremely grateful to have a good husband who helps her with her children when she needs it. In the next instant, she realises that it is actually his function to care of the children, thus ending the first scene, and starting the discussions.

The third scene features a meeting between researchers discussing the organisation of a scientific conference. In this scene, we have three female researchers and three male researchers who present themselves as invisible men (the actors are not on the scene). The scene begins with one of the female researchers reading the agenda, being constantly interrupted by one of the researchers until one colleague interferes and asks him to stop so that the other can continue.

After the agenda of the approved meeting goes to the discussion of the definition of the event coordinator. The male researchers propose a senior researcher who coordinated previous editions but is never present in any meeting, and the female researchers advocate the name of a woman that is genuinely involved with the event for coordination. She accepts the nomination for coordination, suggesting that the senior researcher should be invited as support so that joint work will be necessary due to her experience and network. At this point, the women in this group show how they prefer to work in a collaborative and supportive network and bring up the matter from the scientific committee where men only bump men's names. The last agenda item is the responsibility of the local organising committee, which none of the men present wants to coordinate. It is stated that all the women at the table have already played this role and that they are neither secretaries nor party organisers, yet men are reluctant to play secretarial roles or secondary activities.

Before the meeting is over, one of the invisible male researchers gets up to leave, saying he needs to pick up his son from school. Two of the women find the attitude of a good father beautiful, as he takes good care of his son and compliments him. The third is not moved by the scene, because when a woman plays the same role, the scene is not touching, but negative judgment usually takes place.

These scenes, which sought to show how patriarchy affects professional roles between men and women, brings exciting discussions on why women still have to impose themselves to not always be subdued, or how the system sets that women depend on other women to take care of their children and houses.

Another act that the group Mulheres Cientistas performed was an invisible theatre scene. During a presentation of the project at the university, a male colleague and theatre professor was invited to promote what is called "mansplaining" in the feminist recent literature (Solnit, 2014), which means that a man keeps explaining what a woman has just explained as if the way she communicates in a group is not sufficiently clear. So, during the explanation of the project, the professor would continuously interrupt the talk to congratulate the project and to re-explain what was already explained. This is a prevailing situation, that is often uncomfortable because it steals from the woman the centrality of the talk. On the other hand, it can be very subtle oppression, since all the comments were favourable and sweet. When the scene was revealed at the end of the presentation, a big contradiction was set. The vast

majority of the audience didn't realise that a scene was taking place as if it was normal to have a person in the audience re-explaining the talk. A small survey after the scene revealed that only women related they felt uncomfortable with the constant interruptions. Table 2 summarises the scenes constructed and the debates raised in each piece.

Table 2: Scenes description and emerged discussion.

Scene	Type	Description	Issues raised	Discussion points
1)Researcher private life	Forum Theatre	Clipping of a family that presents a woman, mother of two pre-teens, researcher and wife. The scene also features another woman, the housekeeper and nanny of this family, who is also the mother of a girl.	Double burden; Different forms of exploitation: "the maid debate"	The public raised the debate on the black feminism (Crenshaw, 1989). In Brazil, most hired housekeepers are black. A spect-actor suggested that the researcher should be studying gender oppression, increasing the degree of the contradiction of the scene, and raising the debate on research attitudes.
2)Mother and daughter	Forum Theatre	The researcher has a clash with her daughter who needs to get ready to go to swimming class.	Sexual harassment; Body-shaming; Childcare load spread	A spect-actor brought to the scene the figure of a professor that suggested that students should wear uniforms to avoid girls wearing inappropriate clothing during classes. The scene raised discussions on sexual harassment and identity within academia.
3)Research meeting	Forum Theatre	A meeting between researchers discussing the organisation of a scientific conference.	Sexual division of academic labour; Invisible work in academia	The leaky pipeline might also be related to the large amount of "invisible work" that is mostly done by specific groups.
4)Mansplaining	Invisible theatre	During a presentation of the project at the university, we invited a male colleague and theatre professor to promote what is called "mansplaining"	Credibility	The scene brought up the debate upon how men and women relate in meetings, conferences and classes.

1.5 Action

The study was conducted with four focus groups, composed by high school students, university students or faculty members. During the second semester of 2019, the project actresses performed four times



Figure 1: Some images from the performances. (a) The scene of a mother with her children. The man in blue is a spect-actor that proposed changes in the way the other should act. (b) Theatre exercise during a workshop at Planaltina Campus. (c) Workshop at a high school. (d) An invisible theatre scene: the presenter was constantly being interrupted, and the audience was not aware that a scene was taking place. (Photos taken by the authors)

using different theatre of the oppressed techniques. Our research instruments are documented speeches by spect-actors of the plays, photographic records and analysis by four focus groups. Some images from the performances are shown in Figure 1.

The first performance occurred during a workshop at the university for the external public. Thirty people participated, between 19 and 50 years old, with 40% composed by university rural students, 30% university urban students and 20% by external (from the university) public. After a discussion about the gender imbalance in science, the workshop participants were divided into four subgroups, where each group constructed a scene. Despite the fact that the focus of the workshops were always clearly on gender imbalance on STEM, all the small groups constructed scenes about private life situations, such as child care, domestic violence or sexual division of domestic work.

The second focus group was also composed of university students, but no workshops were offered. On that opportunity, the actresses performed the three first scenes from Table 2. Some spect-actors proposed changes on the scenes, and the proposals were mainly on the housekeeper and researcher relationship (scene #1). There was an explicit discomfort with the settled structure, where a set of gender-oriented layered oppressions are imposed, while a cruel class division also takes place. Once more, the private life aspects got more attention, and it was interesting to notice that the audience proposed no interferences on the meeting configuration (scene #3).

Our third performance was the invisible theatre scene that happened at the campus, during a public presentation, where we simulated a "mansplaining" situation (scene #4). Once again, no workshops were

offered, and in this case, no direct interventions were made, due to the nature of the invisible theatre. We evaluated that invisible theatre has a great potential of promoting silent reflections on people's own behaviour. Although we still don't have the means to present a quantitative result of the impact of the scene, we would like to register that the experience positively reverberated in our community. We received relates from male professors that after the scene, have started to police themselves to avoid undesirable situations. We also evaluate that theatre is suitable to mitigate university dropouts. To illustrate the theatre potential on this concern, a student related to us that gave up from dropping out the university when she realised watching one of the project presentations that she was "not the only girl that had the feeling that university was not designed for her, or that she should be at home taking care of her brother".

Finally, we promoted a workshop in a public high school, with 70 students from 15 to 16 years old. The students were divided into seven groups, and after a discussion on gender imbalance in STEM, they proposed their sketches. This time, the sketches were centred on the university access. The groups performed situations that they believed to limit their admissions at a public university. They created scenes about police violence in front of the school, drug dealing at school, precarious public transport, lack of right places to study at home and the absence of good public libraries near their houses. It was interesting to notice how different but relevant topics appear in each time a workshop is promoted with a different public. Theatre allows personal experiences to be discussed in an organised and systematised way, without exposing intimacies. The mixture of real facts with theatrical elements makes the actor or actress comfortable to expose intimate feelings or nuisances.

2 Achievement and discussion

Our first goal was to bring into the university the discussion about the gender gap in STEM careers. We tried two different approaches: promoting public talks and debates and created a group of studies, with students from three different courses. The discussions were interesting, but the activities were punctual and did not reverberate within the entire campus community. The idea of the groups of studies was to give continuity to the debates. The bibliography of the study group was vast, and the students were engaged with the theme. The most interesting part of the group, though, happened when students brought into discussion their personal experiences, because it was at this point that the participants incorporated the debate. However, talking about personal experiences is usually delicate, and it demands a lot of time from the entire group, to listen, and to promote a safe place for confidences. Thus we noticed that we had to choose a methodology that was capable of systematizing all the exposed experiences, without exposing intimacies and that could be performed in an organised amount of time. At the same time, we wanted to propose a method that could inspire changes to the reality that was being described by the

participants. The experience with political theatre from other projects, such as Terra em Cena program, inspired us to adopt the drama into our practice. We used the data collected from the study groups to create the characters, the forum theatre components and the invisible theatre sketches.

One approach to increasing the effectiveness of forum theatre for gender issues debates would be presenting sketches in which known challenges in women daily life are posed. These kinds of scenes appear to elicit two kinds of undesired reaction from spect-actors: the absence of interaction, given that the audience might not recognise themselves in the scene; or any type of intervention that suggests that the woman is responsible for her own oppression. It is common to observe at harassment scenes interventions from spect actors that assumes the place of the victim and solve the problem by reporting the harassment to someone superior in hierarchy. As pointed by Naessens, interventions should always suggest collective solutions. Focus groups where theatre workshops took place and participants were given time to build their own scenes presented more elaborated interventions than those where only the forum theatre was performed.

Political theatre is a source of research to identify a series of gender inequality boosters in academia. Theatre can unveil the causes of high rates of dropouts, how students perceive gender issues in their personal lives and how several aspects of social relations affect the gender imbalance in academia. Regarding the choices of the scenes of the first focus group, our observations yielded similar results to Boal's statement, that the choices of the sketches topics are always related, directly or indirectly, to personal experiences. We expected initially that the participants would bring scenes strictly related to academic environments gender oppressions, such as sketches of moral or sexual harassments from professors, but the results showed that the theatre has the potential to deepen the understanding of a concept by connecting real data to personal experiences. Theatre experience made it clear that gender imbalance in STEM is a social structured topic, where bridging the gap will only happen with broad public policies for women. We also evaluated from the first workshop that theatre is a safe place to discuss private life issues because the public never knows if the scene is based on real facts or not. In a context of high rates of dropouts and psychological disturbs among students, theatre seems to be an ideal tool to mitigate some relational challenges that are common and also mysterious at the university.

As researchers and professors, it is imperative that while we advance in our research, we also grow in promoting equality in academic work environments, within its all stages. It is clear to us that gender imbalance in STEM careers affects not only academics but also all societal structure. Having more women studying and working in STEM areas is to guarantee the future of a society where men and women have balanced job opportunities, and where technology is developed to promote the interests from both men and women. We plan to assess quantitative results of the forum theatre impact by evaluating the evolution of perception on gender issues on the high school and university focus groups.

Author contribution

S.M.,C.G.,T.S.,C.B and E.A. conceived and directed the project. G.A. conducted sciences workshops and helped with the analysis of the forum theater results. L.S. conducted the forum theater workshops. L.E. helped shape the research and provided data to support forum theater scenes. S.M.,C.G. and T.S contributed to the analysis of the results and the writing of the manuscript.

Competing interests

The authors have declared that no competing interests exist.

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