ABSTRACT
Given the “evidence” that boys have a higher mathematical performance, the present study aims to investigate the problems that may arise in Mathematical Education when in relation to gender issues, i.e. with masculinity, femininity and other social representations. In fact, it is not very unusual to come across statements like “boys learn math easier than girls” or “the woman is very emotional and too little rational”, among others, that can bring certain implications for teaching mathematics, such as the legitimacy and reaffirmation of certain inequalities already materialized in the social sphere. In order to discuss such statements that, in a way, may end up playing a key role in setting certain binarisms concerning the gender identities, this paper presents a post-structuralist discussion and investigates to what extent the difference between boys and girls in Mathematics context is constructed and not natural.

KEYWORDS
Mathematical Education; gender; learning; denaturalization.

Introduction
Research emerges that intermingles into the “universe” of Mathematics Education and the genre in order to problematize some common conceptions, for example, the classic “statement” that men are naturally better in math than women. It is necessary to seek, in the midst of these intersections, subsidies for more broad and critical learning. There are few Brazilian researchers who have engendered in the search for relations between mathematics and gender. Souza and Fonseca (2010, p. 11) emphasize this need when affirming that “discussing the relations between gender and mathematics is, in some ways, a novelty in the field of Mathematics Education in Brazil.”

Given the statistical evidence that boys have a superior performance in mathematics, as shown by Corrêa, Sipraki and Soares (2012), it is not very uncommon to come across statements that associate this difference to a more focused and rational male nature or a more dispersed and emotional female nature. However, is it real that these differences are arising by nature? Actually, are men endowed with a cognitive ability prepared to comfortably receive a more refined mathematical knowledge than women? The discourse concept developed by Michel Foucault and performativity by Judith Butler will help us realize that the answer to these questions, it is a large round ‘not’.

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Speeches and Performativity

Foucault (1995, p. 55-56), when analyzing the concept of speech itself, affirms that the speeches are tools that:

[… ] systematically form the objects that they talk. Certainly the speeches are made of signs; but what they do is more than using these signs to designate things. It is this more that makes them irreducible to the language and to the speech act. It is this more that needs to be brought up and that needs to be described.

This “more” to which the author refers has to do with the ability of speeches, besides pointing out things, of structuring the listener’s thoughts regarding these things. When we repeatedly hear certain discourses that deal with something present in society, for example, we start to conceive that “something” as it was introduced by the speech. And this happens unconsciously. As pointed out by Larrosa (2002, p. 21), “the words do things to us.” Certainly, we have numerous “convictions” with us that, in fact, are not rightfully ours. They were systematically assumed by the speeches we heard throughout our forever incomplete constitution as human beings. The speeches are issued by several social groups, including politics, church, school, newspapers, novels, books, the internet, among many others. We are faced with them and, as Foucault (2000, p. 20) says, we are “language beings”, and these languages will fill and form our interpretive frameworks of thought, that is, our way of thinking.

The performativity idea, developed according to Silva (2000), by Austin (1998) and Butler (1999), has a similar perception to the speech concept. Based on these references, Silva (2000) considers that for one to understand performativity, it is necessary to distinguish between two types of statements: the “descriptive” and “performative”. The “descriptive” statements are those that describe a particular situation, such as “The book is on the table.” The “performative” statements , on the other hand, do not merely describe a state of things, but contribute in making something really happen, such as “I now pronounce you husband and wife” or “I promise I’ll pay you at the end of month”. They are propositions whose enunciation itself is necessary for what it describes to become a reality, that is, propositions that create facts. However, apparently “descriptive” speeches can work as “performatve”, if they are told repeatedly. A good example is the enunciation “John is dumb.” This sentence, even appearing to be purely “descriptive” works as “performatve” because, when repeated a number of times, it ends up creating a fact: “John’s stupidity” becomes real, thanks to incisive repetition of the phrase that defines him as being not endowed with intelligence. It is exactly as proposed by the Nazi Paul Joseph Goebbels’ phrase: “If you tell a lie thousands times (keep repeating it), people will eventually come to believe it.” It is interesting to consider that without repetition, anything happens. Non-repeated speeches will always be in the “descriptive” statements field. The performativity of statements is clearly present in the formation of gender identities. Something like “homosexual people are not normal” or “men learn mathematics better than women” can work within the performativity logic to create facts and inter-subjective truths.
The historical persistence of male hegemony

We are built upon from the experiences and discourses that directly interfere in how we evaluate and interpret the world around us. Certainly, we also cultivate our relation with mathematics permeated by such discursive structures that, in fact, determine to a greater or lesser degree, our view about this science.

If the conceptions that naturally minimize women regarding mathematics persist, certainly there are some social efforts that seek to keep them. These efforts revolve around the speeches that form us as men and women within mathematics. Discursive productions still come to us that reaffirm, day after day, that men are naturally better in mathematics than women. Clearly, looking nowadays, all the struggles of feminist movements contributed immensely to deconstruct this way of thinking. However, as Carvalho (2004, p. 10) stated, “male dominance did not disappear, persisting in all fields of social life.”

Resonating and reverberating throughout the centuries we arrive at the discourses that insist on showing a natural male hegemony in the context of mathematics. Often we do not realize in our social practices the explicit marks of this perception, making it almost an invisible point to deny and we doubt its existence. However, it exists. In fact, instead of saying that it exists, it would be more correct to say that it persists. This happens because the process of construction and consolidation of this idea is much older than we can imagine. In fact, it was over time that this alleged male “superiority” in mathematics arose in people’s minds. And, inevitably, from the moment that a particular understanding of a social phenomenon takes shape and crystallizes in the minds of individuals who live within the same cultural space, this understanding becomes a truth, a constructed truth. When we stop to observe the human history, using both gender and mathematics as analytical categories, we easily realize that the distance between women and mathematics is latent and visible. According to Singh (2002, p. 116):

Institutionalized discrimination against women continued until the twentieth century, when Emmy Noether, described by Einstein as “the most significant creative mathematical genius ever produced since women began to attend higher education studies”, had her request to teach at University Göttingen, denied.

Recognizing and considering this historical context leads us to use the word persistence at the expense of existence. This consideration leads us to the fact that male superiority not only exists, but persists. In the logic of this work, assuming that this differentiation is something that persists is extremely necessary. This is because it is possible to bring out certain histories, besides everything that contributed and contributes to the persistence of this kind of enunciation, whereas when we consider that the male/female polarity within the Mathematics exists, we can make the mistake of not problematizing it, especially taking into account that the meaning of existence “what is” as a permanent state vs to persist “what is and has a reason to be” is not a permanent state. We want to mention the current state of things that does not necessarily refer to the power circumstances and relations that contributed and contribute to the definition and stratification of such things. That is, when a difference exists, it only exists. But when we say that it persists, the expression leads us to consider certain constancy and concatenation of circumstances that generated the event itself that persists.
The speeches reaching us and disseminating in our children and youth: Mathematics learning as a discursive and ideological space

One can think that these same historical speeches, persistent and not just existing, subjectified, made normal and disguised, that some teachers use, even unconsciously and without bad intentions, in their classrooms. Enunciative discourse delimits spaces to be occupied by men and women in the atmosphere of mathematical development, with men developing themselves with much more ease and dexterity than women. Our personal habits and professional methods are always producers of gender identities, identities that inevitably attach on a sexed body a series of determinations socially “inherent” to its sex. Thus, it is assigned to men the role of being good at mathematics, and to women the role to be one step behind in the study of this science. Again, men and women are called to assume their roles. According to Souza and Fonseca (2009a, p. 41 - 42):

Adopting Gender as a category of analysis in Mathematics Education requires and heightens our attention to the fact that gender is produced in social practices that become masculinizing and feminizing practices. Thus, in our classrooms and what composes them (gestures, words, silences, rites, looks, materials, ways of organizing, ways to teach math, learning concepts, etc.) and in our research (even when concealing gender relations), male and female identities are produced.

It is worth recognizing that in our classrooms (and what comprises them) male and female identities are produced and reproduced. Thus, it is possible to consider that often the teacher replicates the idea that actually boys are better in mathematics, without noticing that they are contributing to legitimate a persistent historical differentiation that generates social segregation.

Santos and Cardoso (2012, p. 07) conducted an empirical study to better understand how the unequal relations between boys and girls and Mathematics happen inside the classroom:

All [boys] I interviewed, however, said they are very fond of mathematics, and they do not find it difficult to learn the math contents, in addition loving mathematic classes. The boys commented that the math subject is very easy (Field Journal, 03/01/2012). In another situation, the teacher asked students to use the multiplication table to answer the activity and the boy who was on my side told me: I do not need a multiplication table (Field Journal, 03/06/2012). The boys are making fun of the girls, saying we are smart, when a girl misses the answer in the table (Field Journal, 02/28/2012).

Let us remember, then, the way in which the discourse is set in Foucault’s perspective, as producer and creator of subjective truths and gendered realities. Within this logic, it is not surprising that girls really “accept” their position of not liking the complexity of the numbers on the contexts and situations that pervade throughout school life. The men/female/mathematics relation are produced discursively throughout the experiences that, as we see, say and continuously reaffirm women’s rational fragility, “manufacturing” realities and truths about the individuals. The statements and restatements that predetermine the spaces to be occupied by boys and girls in mathematics class take place within the
dialogue, in conversation, in looks, in relationships, in silences, in plays, in the mistakes and successes. Santos and Cardoso (2002, p. 07-08) also observed teachers during their research and showed that:

An example of this happening is when the teacher began the lesson with an activity of de-composing numbers. Then, the teacher asked students to write on the blackboard and, as always, the boys are called to participate more than girls (Field Journal, 02/23/2012). In remarks made in the classroom, we note that the teacher directs the mathematics class for boys, asking them to respond to the activities in the blackboard, making troubleshooting issues involving their names and they [the boys] like to participate in class. This is so common that the teacher does not invest in girls in these classes. In the correction of an activity, the teacher called students per row to go to the blackboard. Of the five rows that exist in the room, she called four boys and a girl, and the girl did not want to go answer (Field Journal, 03/01/2012). This student was not encouraged by the teacher to go answer the question. When the girls did not answer, she did not insist, then asking a boy to respond. By requesting more boys and encouraging them more than girls, the teacher produces a difference.

In fact, faced with such experiences, it is not unusual that one of these girls cultivates a hate relation about mathematics or one of these boys want to be an engineer or a mathematician in the future. We can think that they are “manufactured” in classrooms, boys endowed of math hegemony and girls often unable to relate healthily with this curriculum component. These are also manufactured in conviviality and dialogue among colleagues, fixed individuals positions that cause exclusion and segregation. The different ways of teaching are, as Larrosa (1994, p. 71) said, “social practices organized and constituted in unequal relations of power and control”. Feminine and masculine are reproduced in our classrooms through statements and subtle restatements.

As said by Souza and Fonseca (2010, p. 42), “in these power relations, all these lives become business, chronicles or cases, for speeches that do not cease to produce and encourage them to produce.” These researchers have also used an empirical study, inserting themselves in mathematics classrooms of an association dedicated to collectors of recyclable materials in the context of the Youth and Adult Education. They were able to define in what manner the statements revolve around the idea that “men are better at mathematics” subtly goes through teaching practices. So subtly, that we rarely realize them. According to the records of Souza and Fonseca (2009b, p. 600 - 601):

A mathematics class (class observed on 05/18/2006, there were nine women and one man) in which the proposal was the resolution of some operations and diverse activities of writing numbers. [...] Lia a young person, recyclable material collector, performed with difficulty some division operations. [...] Pedro, recyclable material collector too, who did not attend the classes, entered the room and stood behind Lia. Seeing her solving operations he began to dictate the answers and said, “You are very stupid.” [...] Then, she closed the notebook and also left the classroom. After a while, Pedro returned to the room and began to help Antônio, who was developing an activity forming numbers with cards. His attitude was different than Pedro had with Lia. [...] Pedro did not call Antônio “stupid”, although the activity performed was more elementary than that performed by Lia and his difficulty appeared to be greater than that demonstrated by her. Pedro only showed the cards that Antônio sought to form the number 17.
If, in fact, boys are prominent in mathematics, including in large-scale assessments as Andrade (2003) points out, we are (in this paper) considering the contexts that individual’s experience that can, potentially, influence the learning process measured by the assessments. Let’s go back to the writings of Souza and Fonseca (2009b, p 600-601.) that illustrates very specifically the nature of these contexts:

Let’s consider the scenario of enunciation two: a workshop on the discussion of the accounts in the Association. Of all men, one answers the mathematical questions proposed. Of all women, one also answers all questions. At one point, the boy who remained quiet at the questions provokes this colleague, urging her [ironically] to answer a question about the total glasses sold in a fortnight and the arising of these sales revenues, “Go, Elisa, talk. You are such a smartass”. Scenario three: a man who is a recyclable material collector explained during the interview how to teach his partner, also a recyclable material collector, to do math accounts. Paulo says: “Eliane, I have to teach her things because she only studied until the fourth grade, right?”. Researcher: “I do not know. Did you study until which grade? “ Paulo:” I even tried to make up to the fourth grade, but [...] I am more advanced than her at school, some things, mathematics, I prefer to teach her math, [...] but she doesn’t, she cannot accept that I’m better than her in math accounts, [...] she cannot stand it, she cannot understand the things”.

It is interesting to note how the “character” Paulo, despite not having consistency in his argument, insists in reaffirming categorically that his partner, Eliane, cannot keep up his male pace within the mathematical development. Even without managing to study up to where his partner studied, that is until the fourth grade, he claims himself as superior, saying she cannot understand things. This is a valid example of how male supremacy search for, at all costs, is undeterred. Everything leads us to believe, as Almeida and Moura (2013, p. 06.) states that “we have made men and women referencing in the dichotomy of modern thought; we compose the world and ourselves in the game of polarities. The opposition between the poles has generated asymmetrical relations guided in the binary: domination-submission”.

**Final considerations: The path of denaturalization**

If these unequal relations are built in an everyday basis for girls and boys, of course they are not natural. Faced with all these questions, it is possible to consider that boys are not naturally better at mathematics than girls, what happens is that they dress themselves compulsorily of a gender, the male gender, which covers an infinity of symbols that give them supremacy, daily and collectively built, in mathematical development spaces. Similarly, girls are not naturally worse in math than boys; the girls dress themselves compulsorily of a gender, the female gender, which covers an infinity of symbols that give them a position of inferiority, historically and socially constructed in mathematical development spaces.

If, as said by Almeida and Moura (2013, p. 02) “regarding mathematics, the Program of International Student Assesment (PISA) 2010 […] presents a lower result of girls, regarding their performance in mathematics, in most participating countries “, we can say that this has absolutely nothing to do with the idea that women constitute as missing beings, but with
the strong discursive media productions that forcefully inculcate in women’s minds that they were not born for mathematics, which may be generating from the elementary school a disincentive regarding the study of this subject, this disincentive that may be a causative element of the levels mentioned by learning tests.

As suggested Walkerdine (1995), it is not that girls are bad in Mathematics. The fact is that the “truth” of child development pathologizes and defines its mathematical development in a manner in which it can, necessarily, be read as bad or inferior. The male/female dichotomy regarding mathematics is not natural: it is constructed, and has many consequences and ramifications.

If this differentiation is built, it is clear that it is subject to deconstruction. And this deconstruction vertically pierces the path of denaturalization and strangeness of male hegemony in the field of the exact sciences. Immersed in this way, we are invited to give rise to explanations for the results indicated by the statistics without, however, associating them with men and women the essence. Demystifying the “truth” that boys are naturally better is a challenge to overcome. Even though it is extremely difficult, we must always be aware of demystifying processes of that “truth”, because the implications of adopting these concepts in the classroom will fall on lives, in a way, they will be guided by our speeches. This is because, as beings that are crossed by “languages and language sprayers”, we are “manufactured and manufactured” [both in our classrooms and in the other social spaces in which we have the opportunity to verbalize what we feel and think] male and female identities that hold the guidelines that often prevent or at least hinder many transcendent possibilities by individuals.

References


