EMP Educação Matemática Pesquisa
ISSN 1983-3156

http://dx.doi.org/10.23925/1983-3156.2023v25i2p238-257

Doesn't the north wind move the windmills? Epistemic racism: mathematics is white, male, and European.

¿No mueven los molinos los vientos del norte? Racismo epistémico: Las matemáticas son blancas, masculinas y europeas

Les vents du nord ne font-ils pas tourner les moulins à vent ? Racisme épistémique : Les mathématiques sont blanches, masculines et européennes

Os ventos do norte não movem os moinhos? Racismo epistêmico: A matemática é branca, masculina e europeia

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Abstract

This paper addresses the intersectionality theme in mathematics education to clarify the existing epistemic racism. Through the presentation of excerpts from Brazilian high school mathematics textbooks, more specifically the pages that deal with the history of mathematics, we argued that, in these analyzed textbooks, mathematics is European, male and white, because the narrative constructed by the creators of these books reproduces the Eurocentric logic of mathematical knowledge, erasing other histories of mathematics and creating a very specific narrative about the construction of human knowledge. The analyses were intersectional as a fundamental concept, as multiple aspects, such as gender, ethnicity, race, and nationality, were taken into consideration. The discourse analysis was the analytical tool that made it possible to look at the math textbooks and describe how the materialization of discourses about teaching and learning occurs, producing a history of mathematics teaching in our time; of what is idealized and what is invisibilized. The 24 volumes of the eight collections approved in PNLD 2018 were analyzed. Using the Atlas TI software, six characteristics were investigated: (i) the content addressed; (ii) the continent of origin of that character; (iii) whether it was a quote in text form or whether, in addition to the text (character's name), there was also a figure or photo; (iv) gender; (v) race; (vi) name. We found 554 references to scientists and mathematicians,

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showing that, in the analyzed books, mathematics is constructed by white and European-origin men.

Keywords: Mathematics curricula, Mathematics textbooks, High school, Intersectionality, Discourse analysis.

Resumen

Este artículo aborda el tema de la interseccionalidad en la enseñanza de las matemáticas para explicitar el racismo epistémico existente. A través de la presentación de extractos de libros de texto de matemática de la enseñanza media brasileña, más específicamente de las páginas que tratan de la historia de la matemática, se argumenta que, en estos libros analizados, la matemática es europea, masculina y blanca, porque la narrativa construida por los desarrolladores de estos libros reproduce la lógica eurocéntrica del conocimiento matemático, borrando otras historias de la matemática y creando una narrativa muy específica sobre la construcción del conocimiento humano. Los análisis se realizaron con la interseccionalidad como concepto fundamental, ya que se tuvieron en cuenta múltiples aspectos, como el género, la etnia, la raza y la nacionalidad. El análisis del discurso fue la herramienta analítica que permitió mirar los libros de texto de matemáticas y describir cómo se produce la materialización de los discursos sobre la enseñanza y el aprendizaje, produciendo una historia sobre la enseñanza de las matemáticas de nuestro tiempo, sobre lo que se idealiza y lo que se invisibiliza. Se analizaron las ocho colecciones aprobadas en el PNLD 2018, que suman 24 volúmenes. Utilizando el software Atlas TI, se investigaron seis características: (i) el contenido abordado; (ii) el continente de origen de ese personaje; (iii) si se trataba de una cita en forma de texto o si, además del texto (nombre del personaje), había también una figura o foto; (iv) género; (v) raza; (vi) nombre. Se encontraron 554 menciones a científicos y matemáticos, lo que demuestra que, en los libros analizados, las matemáticas son construidas por hombres, blancos y europeos.

Palabras clave: Currículos de matemáticas, Libros de texto de matemáticas, Educación secundaria, Interseccionalidad, Análisis del discurso.

Résumé

Cet article aborde le thème de l'intersectionnalité dans l'enseignement des mathématiques afin d'expliciter le racisme épistémique existant. Grâce à la présentation d'extraits de manuels brésiliens de mathématiques pour l'enseignement secondaire, et plus particulièrement des pages qui traitent de l'histoire des mathématiques, il est soutenu que, dans ces livres analysés, les mathématiques sont européennes, masculines et blanches, parce que le récit construit par les

concepteurs de ces livres reproduit la logique eurocentrique de la connaissance mathématique, effaçant d'autres histoires des mathématiques et créant un récit très spécifique sur la construction de la connaissance humaine. Les analyses ont été effectuées en considérant l'intersectionnalité comme un concept fondamental, puisque de multiples aspects ont été pris en considération, tels que le genre, l'ethnicité, la race et la nationalité. L'analyse du discours a été l'outil analytique qui a permis d'examiner les manuels de mathématiques et de décrire comment la matérialisation des discours sur l'enseignement et l'apprentissage se produit, produisant une histoire de l'enseignement des mathématiques de notre époque, de ce qui est idéalisé et de ce qui est invisibilisé. Les huit collections approuvées dans le PNLD 2018 ont été analysées, totalisant 24 volumes. À l'aide du logiciel Atlas TI, six caractéristiques ont été étudiées : (i) le contenu abordé ; (ii) le continent d'origine de ce personnage ; (iii) s'il s'agissait d'une citation sous forme de texte ou si, en plus du texte (nom du personnage), il y avait également une figure ou une photo ; (iv) le sexe ; (v) la race ; (vi) le nom. 554 mentions de scientifiques et de mathématiciens ont été trouvées, montrant que, dans les livres analysés, les mathématiques sont construites par des hommes, blancs et européens.

Mots-clés : Curriculum de mathématiques, manuels de mathématiques, enseignement secondaire, intersectionnalité, analyse du discours.

Resumo

Este artigo aborda o tema interseccionalidade na educação matemática para explicitar o racismo epistêmico existente. Por intermédio da apresentação de trechos de livros didáticos de matemática do ensino médio brasileiro, mais especificamente as páginas que tratam da história da matemática, argumenta-se que, nesses livros analisados, a matemática é europeia, masculina e branca, pois a narrativa construída pelos elaboradores desses livros reproduz a lógica eurocêntrica do conhecimento matemático, apagando outras histórias da matemática e criando uma narrativa muito específica sobre a construção do conhecimento humano. As análises foram feitas tendo a interseccionalidade como conceito fundamental, pois levou-se em consideração múltiplos aspectos, como gênero, etnia, raça e nacionalidade. A análise do discurso foi a ferramenta analítica que possibilitou olhar para os livros didáticos de matemática e descrever como ocorre a materialização dos discursos sobre o ensino e a aprendizagem, produzindo uma história sobre o ensino da matemática do nosso tempo, sobre o que é idealizado e o que é invisibilizado. Foram analisadas as oito coleções aprovadas no PNLD 2018, totalizando 24 volumes. Utilizando-se o software Atlas TI, foram investigadas seis características: (i) o conteúdo abordado; (ii) o continente de origem daquele personagem; (iii) se era uma citação

em forma de texto ou se, além do texto (nome do personagem), havia também uma figura ou foto; (iv) gênero; (v) raça; (vi) nome. Foram encontradas 554 menções à cientistas e matemáticos, mostrando que, nos livros analisados, a matemática é construída por homens, brancos e europeus.

Palavras-chave: Currículos de matemática, livros didáticos de matemática, ensino médio, interseccionalidade, análise do discurso.

Doesn't the north wind move the windmills? Epistemic racism: Mathematics is white, male, and European.

I've broken treaties
Betrayed the rites
Shredded the spear
I've launched myself into space
A scream, an explosion
And what interests me in this
Is not to be defeated
My life, my dead ones.
My crooked ways
My Latin blood
My enslaved soul

(Extract from the song "Sangue Latino" by João Ricardo and Paulo Mendonça, 1973, free translation)

This article presents possible contributions to the discussion about intersectionality in mathematics education. Based on the analysis of Brazilian high schools' mathematics books, we argue that one of the main goals of general education is to turn the student into a desirable person. In the case of mathematics, characters presented in a discursive regularity demonstrate that this "science" was built by white European men.

We argue that this discursive regularity, presented in this analysis, creates a specific idea about the construction of human knowledge. We agree with Mignolo (2009), who alerts us to the necessary epistemic disobedience, problematizing some aspects considered normal in our time.

Since the arrival of European colonizers in America, Africa, and other regions, a new model of power relations has been established:

> Initially, this was the outcome of systematic repression of specific beliefs, ideas, images, symbols, and knowledge that did not serve global colonial domination. Repression fell, above all, on the ancient/traditional ways of producing and preserving knowledge, acquiring perspectives and images, either individual or composing a system, symbols, and modes of signification. It also fell over the resources, patterns, and instruments of formalized and objectified intellectual or visual expression. This was followed by the imposition of the use of the colonizers' patterns of expression, as well as of their beliefs and images regarding the supernatural, which worked not only to prevent the cultural production of the dominated subjects from spreading but also as a very effective form of social and cultural control, when immediate repression ceased to be constant and systematic. The colonizers also imposed a mystified image of their own patterns of knowledge and production of meaning. First of all, they made these patterns inaccessible to the colonized subjects. Later, aiming to co-opt the dominated into some instances of the preeminent power, the colonizers partially and selectively shared some of their knowledge with their vassals. Moreover, European culture became seductive: it gave access to power to the colonized. (Quijano, 1992, p. 12)

Geopolitics walks hand in hand with knowledge. Who generates the knowledge? When? Why? And where? Let us start with the already familiar notion of "situated knowledge". Of course, all knowledge is situated, and all knowledge is constructed. However, this is only the beginning. The question is: Why do we build knowledge? Who does it? When? Why did Eurocentric epistemology hide its own geo-historical and biographical locations and succeed in creating the idea of universal knowledge, as if the constructive subjects of knowledge were also universal? This illusion is present today in social sciences, humanities, natural sciences, and schools. Epistemic disobedience means detaching oneself from the illusion of this zero-point Eurocentric epistemology.

Thus, epistemic racism can be understood as the prioritization or standardization of knowledge considered universal, essential, and built by all humanity but actually constituted of North/Colonial epistemologies. This generated a historical erasure of the Southern/Colonized knowledge, which was regarded as inferior, rudimentary, and second-rate.

These relationships, present to this day, determine what is legitimate knowledge and what is not. This colonial Eurocentrism has provoked resistance movements, creating what is known as a "decolonial perspective" and a "decolonial turn." In this article, we take as a reference some texts by Latin American intellectuals who, in the 1990s, founded the Latin American Group of Subaltern Studies (Grupo Latino-Americano de Estudos Subaltenos) (Ballestrin, 2013), which includes researchers such as Aníbal Quijano, Walter Mignolo, Edgardo Lander, Enrique Dussel, Nelson Maldonado-Torres, among others, as members. These researchers argue in favor of an epistemic disconnection of European concepts, considered unquestionable references (Mignolo, 2008).

Boaventura de Souza Santos calls "epistemologies of the South" (Santos, 2016) the movements that fight for the production and validation of knowledge produced by social groups that were wronged and oppressed by tenderness: capitalism, colonialism, and patriarchy (Santos, 2019). He argues that these three forces act together, producing and maintaining social inequalities.

In addition to bringing a theoretical discussion on epistemic racism, analyzed from the mathematics education perspective, and proposing epistemic disobedience (Mignolo, 2008), we also intend to present examples of how this hierarchy of knowledge still exists, showing excerpts from mathematics textbooks of Brazilian high school, specifically the pages that deal with the history of mathematics.

We argue that the history of mathematics presented in these books is male, white, and European since the narrative constructed by the authors reproduces the Eurocentric logic of

mathematical knowledge, erasing other stories of mathematics, such as the Eastern, African, and Latin American, and excluding women and blacks (Martzloff, 1997; Osen, 1999; Plofker, 2009; Setati & Bangura, 2011).

To this end, we will analyze the eight collections approved in 2018's National Book Program (Programa Nacional do Livro Didático) in Brazil. In all, 24 books were investigated, describing how the characters are presented to students and teachers as the "founders" of mathematics as we know it today. We specifically analyzed the sections that present the history of mathematics, categorizing the characters by their continent of origin, gender, and race.

We tried to demonstrate how epistemic racism materializes in these textbooks, perpetuating the constitutions of technology for second-class subjects. By learning that "true" mathematics was "built" by Europeans, students have their identity as inferior and subaltern individuals reinforced. This technology operates as a cultural pedagogy (M. A. da Silva et al., 2018; M. Silva & Valero, 2018; Valero, 2018a, 2018b; Valero et al., 2019, 2018) that establishes the place of beings, knowledge, and powers (Maldonado-Torres, 2019). This has implications far beyond the relationship between people, as the matrix of racial power is a mechanism that establishes hierarchies for languages, religions, knowledge, and regions of the planet, producing different types of racism (Mignolo, 2008).

Thus, with this article, we intend to deepen the discussions on racism, sexism, and Eurocentrism in mathematics education, considering the perspective of blacks, autochthonous people, Latinos, Africans, Asians, and women, among other social and ethnic groups that were silenced by subtle practices that cause invaluable harmful consequences.

Intersectionality and mathematics education

In addition to the notion of epistemic racism, it is essential to understand the concept of intersectionality. As it is, we will take into consideration multiple aspects: gender, ethnicity, race, and nationality. The concept of intersectional thinking meets the analysis developed here.

Kimberlé Crenshaw was the first to systematize the concept of intersectionality in two fundamental works that present the notions of convergence of discrimination and oppression of specific social groups (Crenshaw, 1989, 1991).

Patricia Hill Collins and Sirma Bilge described this concept perfectly:

> Intersectionality is a way of understanding and analyzing the complexity of the world, people, and human experiences. The events and conditions of social and political life can seldom be understood as shaped by a single factor. They are usually framed differently by many factors that influence each other. Regarding social inequality, people's lives and the hierarchy of power in a given society are best understood as being

> shaped not by a single axis of social division, be it race, gender, or social class, but by many axes that work together and influence each other. Intersectionality as an analytical tool gives people better access to the complexity of the world and of themselves. (Collins & Bilge, 2016, p.1)

The researchers claim that mono-focal studies, that is, studies that address only one of the many dimensions of social inequality, are not powerful enough to engage the complexity surrounding society's problems.

Even though we agree with Collins and Bilge, we also think these mono-focal lenses must work together with multifocal lenses to establish interrelationships with analytical depth. Thus, as already said, we will not rule out the investigation of any of these topics. On the contrary, this mono-focal research shall serve as the starting point for new inquiries focusing on analyzing intersectional aspects.

Professor Kimberlé Williams Crenshaw uses an interesting metaphor to represent the intersections between power relations that may involve social problems:

> Using an intersection metaphor, we will initially make an analogy in which the various axes of power, that is, race, ethnicity, gender, and class, constitute the avenues that structure the social, economic, and political terrains. It is through them that the dynamics of disempowerment move. These avenues are sometimes defined as distinct and mutually exclusive axes of power: racism, for instance, is different from patriarchy, which, in turn, is not the same as class oppression. These systems often overlap and cross their limits, creating complex intersections where two, three, or four axes converge. Racialized women are often positioned in a space where racism or xenophobia, class, and gender meet. Consequently, they are easy targets in the intensive traffic that flows through these avenues. Racialized women and other groups marked by multiple oppressions, positioned at these intersections by their specific identities, must manage the "traffic" that flows through the junctions. This becomes quite dangerous when the traffic flows simultaneously from several directions. Sometimes the damage happens when the impact in one direction throws the victims into an opposite flow. In other situations, the damage results from simultaneous collisions. These are the contexts in which intersectional damage occurs – disadvantages interact with pre-existing vulnerabilities, producing a different dimension of disempowerment (Crenshaw, 2002).

From a Foucaultian perspective (which we here use as an analytical tool), perhaps the words "empowerment" and "disempowerment" do not make much sense since, for the author, power is not localizable. In any case, we consider them powerful concepts to articulate intersectionality and discourse analysis, including methodological aspects.

Theoretical and methodological perspective

In this article, we use the concept of cultural policy and the Foucaultian tool for discourse analysis to investigate Brazilian high schools' mathematics textbooks.

The idea of curriculum as cultural policy emerges in the early 1980s with the works of Henry Giroux (1981, 1983). We opted for the most recent definition, given by Marisa Vorraber Costa. For her, cultural policies refer to

> (…) the political strategies involved in the relations between discourse and power. In general, it concerns how identities and subjectivities are produced and how they circulate in the political arenas of the social forms in which people move. The school, the curriculum, and the textbook are examples of cultural policy arenas where identity clashes occur according to asymmetric power relations. (Costa, 2010, p. 139)

Thus when teaching maths, we also demonstrate how to be an "ideal person." Textbooks or any other curricular text can be seen as a manual that adjusts, homogenizes, normalizes, and standardizes ways of life, having social and political impacts.

> The political effects of policy and research sets must be tracked and discovered in the production of the notions of populations and individuals mathematically (in)competent, (in)capable, (in)productive, and therefore economically, socially, and culturally (ex)included. (Valero & Knijnik, 2016, p. 4)

Although considered harmless by many, school mathematics can be used as an instrument of change, maintenance, and control. Thomas Popkewitz wrote about the effects produced by the mathematics curriculum on the formation of children.

> School subjects are analogous to medieval alchemy. There is a magical change when mathematics, science, and social sciences move from their disciplinary spaces into the classroom. Educational and social psychologies have little, or nothing, to do with understanding disciplinary practices. They are intellectual inventions developed to normalize and govern the child's conduct, relations, and communications. (Popkewitz, 2004, p. 3)

From this perspective, we look at mathematics textbooks as an "alchemy manual" and describe how discourses about teaching and learning materialize, transforming children into adults, manufactured in a serial production scale. In this way, we produce a narrative about teaching mathematics in our time, emphasizing what is idealized and what is invisible.

Discourse analysis based on a Foucaultian perspective has been applied to the analytical processes to describe how these different curricular practices normalize ways of being and living in our time.

According to Foucault, through discourse analysis: "We see the loosening of the embrace, apparently so tight, of words and things, and the emergence of a set of rules proper to discursive practice. These rules define not the changing existence of a reality, nor the canonical use of a vocabulary, but the ordering of objects" (Foucault, 1972, p. 49). Therefore, in this analysis perspective, it is not a matter of describing an alleged existing reality to understand it

in its entirety but of analyzing "practices that systematically form the objects they speak of" (Foucault, 1972, p. 49).

Some research in which this investigator participated and which described these magical effects that drive student and teacher behaviors, using discourse analysis, addressed the history of mathematics in high school textbooks (Ocampos, 2016), the gender approach in workbooks from the early years (M. A. Silva & Souza, 2018; D. M. X. de B. Souza & Silva, 2017a, 2017b, 2018; Valero, Silva, et al., 2019), the desirable subject constitution to inhabit the field (Guida & Neto, 2019; V. F. Neto, 2019; V. F. Neto & Guida, 2019; V. F. Neto & Valero, 2018; V. Neto & Guida, 2019), financial mathematics in high school (Coradetti, 2017; Coradetti & Silva, 2017; Coradetti Manoel & Silva, 2019), interdisciplinarity in high school (Berto, 2017; M. A. da Silva et al., 2018), and the desirable constitution of the citizen (R. R. Souza, 2020) in Brazilian textbooks approved by the PNLD program.

In the case of this investigation, the analysis of recurrences implies an insistence from the creators of these materials to propagate an idea or a specific way of thinking about a topic. In this case: Who invented/produced mathematics? Who is intelligent? Who dictates the norms of our society, and who obeys them? This recurring pattern denotes the order in the discourse of our time. What is valued, legitimized, admired and normalized.

Analyses

In Brazil, textbooks used by public schools are approved by a commission convened by the Federal Government and composed of researchers from public universities and teachers of basic education. The PNLD (Programa Nacional do Livro Didático) is a state policy that distributes free textbooks for students in Brazilian public schools. Publishers submit their books to the editors and have the material evaluated by the committee mentioned above. The approved books form a catalog the teacher can consult and, according to the descriptions presented in this "menu", choose the book they want to work with during the next three academic years. Until 2017, PNLD distributed about 150 million books per year to approximately 120,000 schools, serving roughly 30 million students per year. The average investment of the Federal Government was approximately 400 million dollars per year (Carvalho, 2018), so publishers and authors are very interested in having their works approved in programs like this.

The books analyzed here were approved in PNLD's 2018 evaluation and used in Brazilian high schools in 2018, 2019, and 2020.

Eight collections were approved, each containing three books (one for each year of Brazilian high school). Thus, we analyzed 24 books using Atlas IT software to make the

necessary markings to count the occurrences detailed in the following pages. In Brazilian textbooks, resorting to the history of mathematics as a teaching resource is almost omnipresent, as it is part of the order of educational discourse. Thus, all textbooks cite some historical facts, usually related to the creation of some concept and the characters involved in this creation. In some collections, there are even specific sections to address the topic. The following excerpts are part of two collections that feature the "Brilliant Minds" (Mentes brilhantes) and "A bit of History" (Um pouco de história) sections of the textbooks:

> The "Brilliant minds" section presents the achievements of people who revolutionized mathematics or science in their time. (Paiva, 2015, p. 3)

> Section "A bit of history": the work with the history of mathematics connects students with the process of building knowledge and with the creativity in solving problems faced by humanity over time. (Degenszajn et al., 2016, p. 4)

We chose to create categories to analyze all mentions of historical characters that involved, in some way, their relationship with mathematics and science. For each reference, we identified six characteristics: (i) the content addressed; (ii) the character's continent of origin; (iii) whether it was a quotation in text form or whether, in addition to the text (character name), there was also a figure or photo of the scientist; (iv) gender; (v) ethnicity and (vi) name. The following image presents an example of marking performed with the help of Atlas TI software using the parameters mentioned above: sequences, Europe, figure, male, white, Carl Friedrich Gauss.

Figure 1.

Example of coding using Atlas IT software (Dante, 2016, p. 218)

At the end of the analysis, the software reached 554 appearances. It is worth noting that we used them to analyse the recurrence of given patterns, which constitute, according to our theoretical support, an idealized subject considered as a reference of intelligence and wisdom.

In this article, we bring discussions on three categories –the continent of origin of the characters, their sex, and their race– which we regard as adequate to show a profile of the desirable "I" built over the history of mathematics. The immediate consequence is the exclusion of the "other."

Of the 554 appearances, 365 were accompanied by a picture or photograph. Generally speaking, their names are presented next to their country of origin and the year of birth and death: "The Swiss mathematician Leonhard Euler (1707-1783)". The figure-shaped presentation reinforces racial identity. The more quoted mentioned characters were: Carl Friedrich Gauss (28 times), René Descartes (15), Gottfried Wilhelm von Leibniz (15), Girolamo Cardano (14), Pythagoras (13), Galileo Galilei (13), Euclid (13), Thales of Miletus (12) and Archimedes (12). All of them are white European men (at least they were represented as such in the books).

Regarding the mathematical contents worked, most of the citations addressed the following themes: analytical geometry (63), spatial geometry (62), complex numbers (59), trigonometry (46), logarithmic function (38), polynomials and algebraic equations (37), probability (33), matrices and determinants (32), set theory (29) and combinatorial analysis (29).

Regarding the continent of origin (birth) of the personalities mentioned, 500 citations were from European researchers, 22 came from Asia, 21 were from North America, nine were from South America, and only two mentions came from African mathematicians. References to Asian authors include Russians, such as Nikolai Lobachevsky, and characters from the Arabian world. Since not everyone was represented by images, we turned to Google Images to see how these characters were presented in illustrations. About the Arabian scientists and mathematicians, we could find examples of "whitening" as their pictures varied greatly in skin tone. The two mentions of African authors refer to the Egyptian astronomer and mathematician Ibn Yunus. There were no figures representing him in the books. However, the use of images obtained through Google Images query demonstrated that several of his pictures presented the same "whitening" effect observed in the characters of the Arab world.

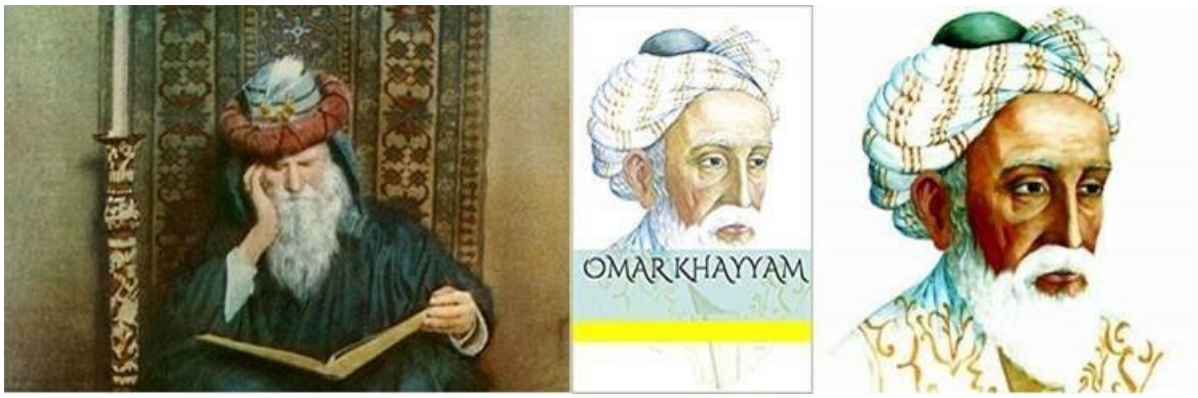
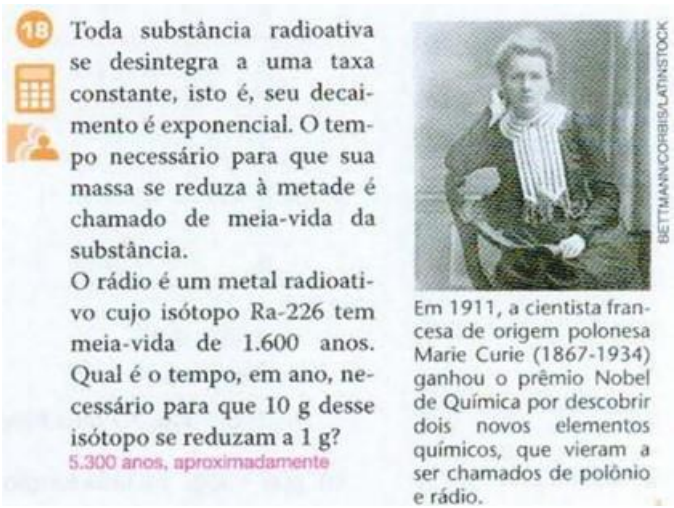


Figure 2.

"Whitening" effect, Omar Khayyam (Google Images)

Figure 2 presents three depictions of the same character (Omar Khayyam), each with a different skin tone. Note that the images in the middle and to the right are the same, thereby proving an evident "bleaching" regarding the central one. The image on the left shows an even whiter version of the mathematician.

As for gender, the marking presented a frightening but not surprising result: 550 mentions to men and only 4 to women. Among women, only one was a scientist: Marie Curie, who was mentioned in the last activity of a chapter dealing with the logarithmic function.


18 Toda substância radioativa se desintegra a uma taxa constante, isto é, seu decaimento é exponencial. O tempo necessário para que sua massa se reduza à metade é chamado de meia-vida da substância.

O rádio é um metal radioativo cujo isótopo Ra-226 tem meia-vida de 1.600 anos. Qual é o tempo, em ano, necessário para que 10 g desse isótopo se reduzam a 1 g?

5.300 anos, aproximadamente

Em 1911, a cientista francesa de origem polonesa Marie Curie (1867-1934) ganhou o prêmio Nobel de Química por descobrir dois novos elementos químicos, que vieram a ser chamados de polônio e rádio.

Figure 3.

Marie Curie, the only female scientist represented in the books (Paiva, 2015, p. 247)

The other three women were the Brazilian artists Regina Scalzilli Silveira and Beatriz Milhazes and the Ukranian Sonia Delaunay. In the textbooks, these three women connect art and mathematics by linking their artistic works with spatial and analytic geometry. In fact, this was an interesting feature: the mentioned Brazilians were usually people linked to art or

architecture, never scientists or mathematicians. Finally, concerning the most shocking result of the investigation: black authors we not cited. Of the 554 citations, 546 were white, and eight were Asian. This is a peculiar effect of discourse analysis: although there are specific laws to prevent segregation and racial inequality from occurring, and although textbooks are also evaluated by experts with strict guidelines to disapprove of workbooks that contain racist connotations, there are always gaps through which structural racism manifests itself. For discourse analysis, nothing is hidden, everything is on the surface, and everything is explicit. However, we do not always see it.

Endnotes

In this article, we tried to demonstrate how mathematics textbooks in Brazil reproduce an epistemic "I" that is far from representing Brazilians themselves, who are seen as the "others" of epistemic logic: Latinos, blacks, women, among so many other categories that we could list from subaltern, segregated, discriminated, invisible and silenced social groups. Despite Brazilian educational public policies that, for more than 15 years, have promoted actions to eliminate inequalities and segregation, the authors concluded that the characters taken as a reference of "brilliant minds" who contributed to the progress of mathematics and science are white European men. Brazilians, blacks, and women are made invisible by a socio-political discourse that privileges a group and erases stories from mathematics, producing only an official history in which, as always, the colonizers are superior to the colonized.

Through discourse analysis, we concluded that the political discourses prescribed by the Federal Government did not influence this didactic material, thereby characterizing epistemic racism. The structural racism prevailing in Brazil is stronger and more influential than the discourse of affirmative actions.

But, under these circumstances, what should be done?

The first step is to denounce this segregation by publishing studies like this and demanding the legislation to be enforced and the publishers to include other characters in their books.

Increasing the representation of "others": black people and women from other countries and continents of origin of these books would be a major breakthrough. In the Brazilian case, to present Brazilian and Latino mathematicians and scientists, including blacks and women. It fits the definition of epistemic disobedience, considering the dominant epistemic truth.

We have a long, more combative than idealistic, way to go because, to change the structure of society, we must fight for an education (including mathematics) that serves to

dismantle the processes of exclusion and creates new projects for the world, beyond capitalism, colonialism, and patriarchy.

Due to our understanding that all writing is political, we end this article with photos and a brief description of scientists and mathematicians who are as important as all those mentioned in the textbooks but who, unfortunately, were left out. We shall work so that these characters can be included in future editions of Brazilian mathematics textbooks. Only with movements like this, we may, in the future, see the excluded being represented in textbooks, regarded as legitimate producers of knowledge and builders of contemporary science.

Figure 4.

Viviane dos Santos Barbosa (Salvador, Brazil) is a researcher from Bahia who became famous for developing a catalytic product that reduces polluting gas emissions.
(https://twitter.com/ELAS_NasExatas/status/1058463857700691968/photo/1)

Figure 5.

Sônia Guimarães (Brotas, Brazil) is a Brazilian physicist, professor at the Technological Institute of Aeronautics (Instituto Tecnológico de Aeronáutica - ITA), the first black Brazilian woman to hold a PhD in physics and the first black Brazilian woman to teach at ITA, having

joined in 1993, when the institution still did not accept women as students. (https://en.wikipedia.org/wiki/Sonia_Guimarães)

Figure 6.

Maria Laura Mouzinho Leite Lopes (Timbaúba, Brazil) was a Brazilian mathematician, the first Brazilian PhD in mathematics, specializing in mathematics education. (https://en.wikipedia.org/wiki/Maria_Laura_Moura_Mouzinho_Leite_Lopes)

Figure 7.

Biologist and cytotechnologist at the Universidade Federal do Rio de Janeiro (UFRJ), Simone Maia, is the president of the National Association of Cytotechnology (Associação Nacional de Citotecnologia - Anacito). She is the only active Brazilian member of the International Academy of Cytology (IAC).

http://www.rets.epsjv.fiocruz.br/sites/default/files/images/simone_maia_evaristo_rede_cancer.pdf

References

Ballestrin, L. (2013). América Latina e o giro decolonial. Revista Brasileira de Ciência Política, 11, 89117. https://doi.org/10.1590/S0103-33522013000200004

Berto, L. F. (2017). Enunciados sobre Interdisciplinaridade em Livros Didáticos de Matemática do Ensino Médio [Dissertação (Mestrado em Educação Matemática)]. Programa de Pós-Graduação em Educação Matemática, Universidade Federal de Mato Grosso do Sul.

Collins, P. H., & Bilge, S. (2016). Intersectionality (Interseccionalidade). Polity Press.

Coradetti, C. A. L. M. (2017). Um Olhar Contemporâneo para a Matemática Financeira presente nos Livros Didáticos do Ensino Médio [Dissertação (Mestrado em Educação Matemática)]. Programa de Pós-Graduação em Educação Matemática, Universidade Federal de Mato Grosso do Sul.

Coradetti, C. A. L. M., & Silva, M. A. (2017). A Tomada de Decisão: tensionamentos de uma instrução dada pela matemática financeira dos livros didáticos de matemática do ensino médio. Perspectivas Da Educação Matemática, 10(22), 65-86.

Coradetti Manoel, C. A. L., & Silva, M. A. da. (2019). Famílias felizes e saudáveis! Livros didáticos de matemática e a produção de sujeitos. Reflexão e Ação, 27(2), 219-235. https://doi.org/10.17058/rea.v27i2.11740

Costa, M. V. (2010). Poder, discurso e política cultural: contribuições dos Estudos Culturais ao campo do currículo. In A. C. Lopes & E. Macedo (Eds.), Currículo: debates contemporâneos (3ª ed.). Cortez.

Crenshaw, K. (1989). Demarginalizing the Intersection of Race and Sex: A Black Feminist Critique of Antidiscrimination Doctrine, Feminist Theory and Antiracist Politics [Uma crítica feminista negra à doutrina anti-discriminação, à teoria feminista e à política anti-racista]. University of Chicago Legal Forum, 1, 139-167.

Crenshaw, K. (1991). Mapping the Margins: Intersectionality, Identity Politics, and Violence against Women of Color. Stanford Law Review, 43(6), 1241-1299.

Crenshaw, K. (2002). Documento para o encontro de especialistas em aspectos da discriminação racial relativos ao género. Revista Estudos Feministas, 10(1), 171-188. https://doi.org/10.1590/S0104026X2002000100011

Dante, L. R. (2016). Matemática: contexto & aplicações (Vol. 1). Ática.

Degenszajn, D., Iezzi, G., Almeida, N. de, Dolce, O., & Périgo, R. (2016). Matemática: ciências e aplicações (9ª ed., Vol. 1). Saraiva.

Foucault, M. (1972). A arqueologia do saber e o discurso sobre a linguagem. Em A. M. S. Smith (Trans.), 1971. Pantheon Books.

Giroux, H. A. (1981). Ideology, culture & the process of schooling (Ideologia, cultura e o processo de escolarização). Temple University Press.

Giroux, H. A. (1983). Teoria e resistência em educação: uma pedagogia para a oposição. Bergin & Garvey. https://books.google.se/books?id=aXecAAAAMAAJ&dq=theory and resistance in education giroux&hl=pt-BR&source=gbs_book_other_versions

Guida, A. M., & Neto, V. F. (2019). O que fazem os animais nos livros didáticos de matemática para as escolas do campo? Problematizações com as lentes dos estudos animais. 6(1), 148-168.

Maldonado-Torres, N. (2019). Analítica da colonialidade e da decolonialidade: algumas dimensões básicas. In J. Bernardino-Costa, N. Maldonado-Torres, & R. Grosfoguel (Eds.), Decolonialidade e pensamento afrodiaspórico (2.ª ed., pp. 27-53). Autêntica.

Martzloff, Sj.-C. (1997). Uma História da Matemática Chinesa (S. S. Wilson (trans.)). Springer. https://doi.org/10.1007/978-3-642-56680-6

Mignolo, W. D. (2008). Desobediência Epistêmica: a opção descolonial e o significado de identidade em política (Â. L. Norte, trans.). Cadernos de Letras Da UFF, 34, 287-324.

Neto, V. F. (2019). Quando aprendo matemática, também aprendo a viver no campo? Mapeando subjetividades [Tese (Doutorado em Educação Matemática)]. Programa de Pós-Graduação em Educação Matemática, Universidade Federal de Mato Grosso do Sul.

Neto, V. F., & Guida, A. M. (2019). Processos de Subjetivação Movimentados em Livros Didáticos de Matemática para a Educação do Campo: descrevendo e analisando o habitante desejável do campo. Revista Educação Em Debate, 41(80), 185-203. https://doi.org/10.24882/eemd.v41i80.920

Neto, V. F., & Valero, P. (2018). O livro didático de matemática para a população rural no Brasil: aprendendo a ser um agricultor modernizado. In E. Bergqvist, M. Österholm, C. Granberg, & L. Sumpter (Eds.), Proceedings of the 42nd Conference of the International Group for the Psychology of Mathematics Education (No. 42; Vol. 3, pp. 411-418). PME.

Neto, V., & Guida, A. (2019). Redes discursivas: animais, campo, Matemática escolar e contribuições metodológicas da análise de redes. Educação Matemática Debate, 3(8), 194-212. https://doi.org/10.24116/emd.v3n8a05

Ocampos, J. D. G. (2016). Redes Discursivas Sobre a História da Matemática em Livros Didáticos do Ensino Médio [Dissertação (Mestrado em Educação Matemática)]. Programa de Pós-Graduação em Educação Matemática, Universidade Federal de Mato Grosso do Sul.

Osen, L. M. (1999). Women in Mathematics (15ª ed.). The Massachusetts Institute of Technology Press.

Paiva, M. R. (2015). Matemática - Paiva (3ª ed.). Moderna.

Plofker, K. (2009). Mathematics in India. Princeton University Press. file:///C:/Users/youhe/Downloads/kdoc_o_00042_01.pdf

Popkewitz, T. S. (2004). A Alquimia do Currículo de Matemática: Inscriptions and the Fabrication of the

Child. American Educational Research Journal, 41(1), 3-34. https://doi.org/10.3102/00028312041001003

Quijano, A. (1992). Colonialidad Modernidad/Racionalidad. Perú Indígena, 13(29), 11-20.

Quijano, A. (2000). Colonialidad del poder, eurocentrismo y América Latina. In E. Lander (Ed.), A colonialidade do saber: eurocentrismo e ciências sociais - Perspectivas latino-americanas (pp. 193238). CLACSO, Consejo Latinoamericano de Ciencias Sociales.

Santos, B. de S. (2016). Epistemologias do Sul. In Epistemologias do Sul: justiça contra o Epistemicídio. Routledge. https://doi.org/10.4324/9781315634876

Santos, B. de S. (2019a). O fim do império cognitivo: a afirmação das epistemologias do Sul (1ª ed.). Autêntica.

Santos, B. de S. (2019b). O fim do império cognitivo: o amadurecimento das epistemologias do Sul (Duke Unive). https://doi.org/10.32992/erlacs.10570

Setati, M., & Bangura, A. K. (2011). Matemática africana: From Bones to Computers. University Press of America.

Silva, M. A. da, Valero, P., Coradetti Manoel, C. A. L., & Berto, L. F. (2018). Livros didáticos de matemática do ensino médio brasileiro e a constituição do bom aluno cidadão. Acta Scientiae, 20(6). https://doi.org/10.17648/acta.scientiae.v20iss6id4831

Silva, T. T. da. (2005). Documentos de identidade: uma introdução às teorias do currículo. In 1999 (2ª ed.). Autêntica.

Silva, M. A., & Souza, D. M. X. de B. (2018). Ensinando meninas e meninos: abordando estereótipos de género no currículo de matemática. Livro de Resumos da Conferência JustEd 2018 'Promovendo a Justiça através da Educação', 79.

Silva, M., & Valero, P. (2018). Livros didáticos do ensino médio brasileiro: a matemática e a subjetividade dos alunos. In E. Bergqvist, M. Österholm, C. Granberg, & L. Sumpter (Eds.), Proceedings of the 42nd Conference of the International Group for the Psychology of Mathematics Education (No. 42; Vol. 4, pp. 187-194). PME.

Souza, D. M. X. de B., & Silva, M. A. (2017a). A Regência do Currículo de Matemática: uma racionalidade para governar modos de vida. In J. C. Morgado, H. Norberto, & J. Souza (Eds.), Currículo, Ideologia,

Teorias e Políticas Educacionais (Vol. 6, pp. 718-726). ANPAE. http://www.coloquiocurriculo.com.br/diversos/Serie6.pdf

Souza, D. M. X. de B., & Silva, M. A. (2017b). Questões de gênero no currículo de matemática: atividades do livro didático. Educação Matemática Pesquisa, 19(3), 374-392. https://doi.org/10.23925/19833156.2017v19i3p374-392

Souza, D. M. X. de B., & Silva, M. A. (2018). O dispositivo pedagógico do currículo-brinquedo de matemática, marcado pela dimensão de gênero, na produção de subjetividades. Reflexão e Ação, 26(2), 149-164. https://doi.org/10.17058/rea.v26i2.11747

Souza, R. R. (2020). Formação Cidadã: o que apontam os livros didáticos de matemática do ensino médio [Dissertação (Mestrado em Educação Matemática)]. Programa de Pós-Graduação em Educação Matemática, Universidade Federal de Mato Grosso do Sul.

Valero, P. (2018a). Capital humano: o currículo de matemática escolar e a fabricação do homus oeconomicus neoliberal. In E. V. Godoy, M. A. Silva, & V. de M. Santos (Eds.), Currículos de matemática em debate: questões para políticas educacionais e para a pesquisa em Educação Matemática (1ª ed.). Editora Livraria da Física.

Valero, P. (2018b). Capitais Humanos: Matemática escolar e a construção do Homus Oeconomicus. Journal of Urban Mathematics Education, 11(1&2), 103-117. http://edosprey.gsu.edu/ojs/index.php/JUME/article/view/363/236

Valero, P., & Knijnik, G. (2016). A educação matemática como uma questão de política. Em M. A. Peters (Ed.), Encyclopedia of Educational Philosophy and Theory (pp. 1-6). Springer Singapore. https://doi.org/10.1007/978-981-287-532-7_523-1

Valero, P., Norén, E., Silva, M. A., & Neto, V. F. (2019). O cidadão matematicamente competente nos currículos e livros didáticos de matemática do Brasil e da Suécia. Anais

da Décima Conferência Internacional de Educação Matemática e Sociedade (MES10), Artigo 10.

Valero, P., Norén, E., Silva, M. A., & Neto, V. F. (2018). Rumo à justiça social através da matemática? Política curricular e processos de in (ex) clusão. Livro de Resumos da Conferência JustEd 2018 'Promovendo a Justiça através da Educação', 88.

Valero, P., Silva, M. A., & Souza, D. M. X. de B. (2019). O brinquedo curricular, a matemática e a produção de subjetividades de género. Anais da Décima Conferência Internacional de Educação Matemática e Sociedade (MES10), Artigo 10.