

An analysis of student agency in texts of mathematics education

Un análisis sobre la agencia estudiantil en textos de educación matemática

Une analyse sur l'agence des étudiants dans les textes de l'éducation mathématique

Uma análise sobre agência dos alunos em textos de educação matemática

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Abstract

This study aims to understand how colonial structures manifest and influence the concepts that deal with student agency in reference articles in the field of mathematics education. To this end, it analyzed student agency in mathematics education from the perspective of social justice, using as reference the contributions of Rochelle Gutiérrez and Jo Boaler, in addition to the notion of coloniality of power and knowledge proposed by Catherine Walsh. The methodology involved critical analysis that seeks to understand and question the structures of domination and power, based on the works of authors such as Eric Gutstein, Imani Goffney, Rochelle Gutiérrez, and Melissa Boston, Ubiratan D'Ambrósio, Marilyn Frankenstein, and Paola Valero, aiming to identify nuances and contradictions in relation to student agency. The main results revealed that even authors committed to social justice can reproduce hierarchical and oppressive views regarding students. Colonial structures were identified in various aspects, including the attribution of power and authority to the teacher, the reproduction of Eurocentric narratives, and the limitation of student agency. The critical analysis also highlighted the importance of considering how mathematics education can generate selection, exclusion, and segregation. The conclusions point to the need to deconstruct the colonial structures in education and promote a critical and reflective approach. It is essential to value the experiences, perspectives, and knowledge of students and thus build a more inclusive, equitable, and empowering mathematics

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education. The student agency should be strengthened and enable them to become active agents in the construction of knowledge and the fight for social justice.

Keywords: Colonialism, Student agency, Social justice, Analytical elements.

Resumen

Este estudio tiene como objetivo comprender cómo las estructuras coloniales se manifiestan e influyen en los conceptos que tratan de la agencia de los estudiantes en artículos de referencia en el campo de la educación matemática. Para ello, analizó la agencia de los estudiantes en la educación matemática desde la perspectiva de la justicia social, utilizando como referencia las contribuciones de Rochelle Gutiérrez y Jo Boaler, además de la noción de colonialidad del poder y del saber propuesta por Catherine Walsh. La metodología involucró un análisis crítico que busca comprender y cuestionar las estructuras de dominación y poder, a partir de las obras de autores como Eric Gutstein, Imani Goffney, Rochelle Gutiérrez y Melissa Boston, Ubiratan D'Ambrósio, Marilyn Frankenstein y Paola Valero, buscando identificar matices y contradicciones en relación con la agencia del estudiante. Los principales resultados revelaron que incluso autores comprometidos con la justicia social pueden reproducir visiones jerarquizadas y opresivas en relación con los estudiantes. Las estructuras coloniales se identificaron en varios aspectos, incluyendo la atribución de poder y autoridad al profesor, la reproducción de narrativas eurocéntricas y la limitación de la agencia de los estudiantes. El análisis crítico también destacó la importancia de considerar cómo la educación matemática puede generar selección, exclusión y segregación. Las conclusiones apuntan a la necesidad de deconstruir las estructuras coloniales presentes en la educación y promover un enfoque crítico y reflexivo. Es fundamental valorar las experiencias, perspectivas y conocimientos de los estudiantes y, así, construir una educación matemática más inclusiva, equitativa y capacitadora. La agencia del estudiante debe ser fortalecida y posibilitar que se convierta en agente activo en la construcción del conocimiento y en la lucha por la justicia social.

Palabras clave: Colonialismo, Agencia del estudiante, Justicia social, Elementos analíticos

Résumé

Cette étude vise à comprendre comment les structures coloniales se manifestent et influencent les concepts traitant de l'agence des élèves dans des articles de référence dans le domaine de l'éducation mathématique. Pour ce faire, elle a analysé l'agence des élèves en éducation mathématique sous l'angle de la justice sociale, en utilisant comme références les contributions

de Rochelle Gutiérrez et Jo Boaler, ainsi que la notion de colonialité du pouvoir et du savoir proposée par Catherine Walsh. La méthodologie a impliqué une analyse critique visant à comprendre et à remettre en question les structures de domination et de pouvoir, à partir des œuvres d'auteurs tels qu'Eric Gutstein, Imani Goffney, Rochelle Gutiérrez et Melissa Boston, Ubiratan D'Ambrósio, Marilyn Frankenstein et Paola Valero, en cherchant à identifier les nuances et les contradictions en relation avec l'agence de l'élève. Les principaux résultats ont révélé que même les auteurs engagés en faveur de la justice sociale peuvent reproduire des visions hiérarchisées et oppressives envers les élèves. Les structures coloniales ont été identifiées dans divers aspects, incluant l'attribution de pouvoir et d'autorité à l'enseignant, la reproduction de récits eurocentriques et la limitation de l'agence des élèves. L'analyse critique a également souligné l'importance de considérer comment l'éducation mathématique peut générer sélection, exclusion et ségrégation. Les conclusions indiquent la nécessité de déconstruire les structures coloniales présentes dans l'éducation et de promouvoir une approche critique et réflexive. Il est essentiel de valoriser les expériences, les perspectives et les connaissances des élèves et, ainsi, de construire une éducation mathématique plus inclusive, équitable et habilitante. L'agence de l'élève doit être renforcée et lui permettre de devenir un agent actif dans la construction du savoir et dans la lutte pour la justice sociale.

Mots-clés: Colonialisme, Agence de l'élève, Justice sociale, Éléments d'analyse.

Resumo

Este estudo objetiva compreender como as estruturas coloniais se manifestam e influenciam os conceitos que tratam da agência dos alunos em artigos de referência no campo da educação matemática. Para tanto, analisou a agência dos alunos na educação matemática sob a perspectiva da justiça social, utilizando-se como referência as contribuições de Rochelle Gutiérrez e Jo Boaler, além da noção de colonialidade do poder e do saber proposta por Catherine Walsh. A metodologia envolveu a análise crítica que busca compreender e questionar as estruturas de dominação e poder, a partir das obras de autores como Eric Gutstein, Imani Goffney, Rochelle Gutiérrez e Melissa Boston, Ubiratan D'Ambrósio, Marilyn Frankenstein e Paola Valero, buscando identificar nuances e contradições em relação à agência do aluno. Os principais resultados revelaram que mesmo autores comprometidos com a justiça social podem reproduzir visões hierarquizadas e opressivas em relação aos alunos. As estruturas coloniais foram identificadas em diversos aspectos, incluindo a atribuição de poder e autoridade ao professor, a reprodução de narrativas eurocêtricas e a limitação da agência dos alunos. A análise crítica também destacou a importância de considerar como a educação matemática pode

gerar seleção, exclusão e segregação. As conclusões apontam para a necessidade de desconstruir as estruturas coloniais presentes na educação e promover uma abordagem crítica e reflexiva. É fundamental valorizar as experiências, as perspectivas e os conhecimentos dos alunos e, assim, construir uma educação matemática mais inclusiva, equitativa e capacitadora. A agência do aluno deve ser fortalecida e possibilitar que ele se torne agente ativo na construção do conhecimento e na luta por justiça social.

Palavras-chave: Colonialismo, Agência do aluno, Justiça social, Elementos de análise.

An analysis of student agency in texts of mathematics education

The love of freedom and democracy are daily practices for an authentic and transformative education, as proposed by Paulo Freire in his reflections in the book *Pedagogia do Oprimido* [Pedagogy of the Oppressed] (1971). However, the persistence of vertical models in education, including the context of mathematics, is still noticeable. Therefore, to make significant changes, teachers must take on the role of knowledge mediators, encouraging the active participation of students and creating a collaborative environment in which learning occurs for both. Furthermore, valuing freedom, democracy, and solidarity as essential educational principles is paramount for forming critical and participatory individuals committed to building a society that promotes social justice.

Paulo Freire (1971) explains that in a vertical relationship, the teacher is the holder of knowledge, while the students have a passive role, arguing that this perpetuates oppression and inequalities. On the other hand, in a horizontal relationship, students play an active role.

Problem-based education, in turn, promotes horizontal relationships, with the teacher acting as a facilitator, encouraging students to build knowledge and effectively participate, which empowers them to think critically and make autonomous decisions. The Freirean ideas are relevant in contemporary education, promoting a fairer and more equitable system. Math educators think building horizontal relationships involves allowing students to express themselves, creating safe environments, and eliminating stereotypes, which maximizes students' learning potential.

In the face of such necessity, teachers must continue looking for ways to create democratic teaching and learning spaces, even if they are familiar with liberating practices. Therefore, remaining vigilant against colonial remnants present in society and particularly in education -which can influence teaching practice, especially in mathematics teaching- is a necessity.

The emphasis on mathematics is because this subject has often been and continues to be taught in a traditional, hierarchical, and decontextualized way. Historically, mathematics teaching has been marked by an authoritarian approach, through which the teacher, holder of all knowledge, transmits it to students, who receive it passively, leaving little space for active student participation.

Likewise, mathematics has been and continues to be a tool of social exclusion in some cultures, i.e., it categorizes and segregates specific groups, which has created a stigma around

mathematics for many students, reinforcing the idea that only a few can understand it and excel in this area.

In the context of the horizontal relationship proposed by Paulo Freire, “student agency” is a crucial concept. Student agency refers to students’ ability to control their own learning, to make active decisions, and to be active participants in the educational process. In Freire’s problematizing education, students are encouraged to be active agents in building their knowledge, sharing their ideas, participating in discussions, and contributing to curriculum development. This aligns with the notion of student agency, which allows them to shape their own educational path.

Furthermore, it is important to recognize that the transition to a more participatory and critical approach in mathematics education should not be attributed solely to teachers’ initial education or classroom practice. Although teacher education promotes pedagogical competencies and innovative practices, it is equally important to value and recognize students’ agency as active participants in their learning processes. This perspective emphasizes the value of a horizontal and collaborative relationship between teachers and students, in which both are responsible for building mathematical knowledge in a critical and emancipatory way.

In mathematics education, agency refers to students’ ability to exercise their autonomy, make decisions, express their ideas, and actively participate in the learning process. The teacher committed to liberating practices must recognize and value this agency, constantly seeking to understand the nuances that involve it. Jo Boaler, a researcher in mathematics education, has advocated the importance of student agency and promoting a participatory approach to mathematics teaching. The author states that students have a mathematical voice and can be active participants in constructing their own knowledge. Boaler highlights the need to value students’ perspectives and experiences, stating that mathematics is a human discipline and should be taught in a way that honors students’ humanity. According to Boaler (2000, p. 189, our translation), “In didactic mathematics classrooms, student participation is defined by textbooks, rules, and procedures - they are excluded from negotiating or developing procedures; they are restricted in their application of themselves; and their ideas, inventiveness and general agency do not seem to be valued.”

However, despite this existing option, it is worrying to note that many teachers, albeit familiar with these concepts, still reproduce discourses and practices that subjugate students, reinforcing colonizing and inegalitarian dynamics. According to Walsh (2008, p. 137, our translation), coloniality can be identified by the “formation and distribution of social identities from superiority to inferiority.” The author states that this dynamic devalues other ways of

knowing. This is often the type of relationship where the teacher relegates students to a subordinate position. And yet, Walsh (2008, p. 137, our translation) states that “This coloniality of knowledge is particularly evident in the educational system (from school to university), where European knowledge and science are elevated as the benchmark scientific-academic-intellectual.”

The concept of “colonialism” can be associated with the vertical relationship discussed by Freire. The vertical relationship, with its asymmetrical power, can be seen as a reflection of the dynamics of colonization, in which the colonizer holds power and control over the colonized. In this context, the teacher acts as the “colonizer” of knowledge, while the students are the “colonized” who passively receive the imposed knowledge. Educational colonialism can be interpreted as a form of oppression that perpetuates inequalities and limits students’ agency, making them subject to a hierarchical education system.

Therefore, mathematics educators must reflect on their own actions and speeches critically, question the relationships of knowledge present in the classroom, and constantly seek to promote spaces for dialogue, mutual respect, and student empowerment, which is characteristic of committed educators’ actions. Thus, through this constant questioning and vigilance, one can truly move towards a transformative and liberating mathematics education.

Student agency and its impact on teacher participation represents a significant shift in classroom dynamics, where students can shape the learning experience by expressing their needs, interests, and perspectives regarding mathematics. This approach recognizes students’ ability to play an active role in building knowledge and transforming educational practice. However, although teacher education is essential, it must go beyond considering that educators are the only ones responsible and recognize students’ participation as active agents in their own educational process.

As a contribution to advancing this relevant issue, in research developed during the course “Tendências em Educação Matemática II: Aspectos Sociopolíticos em Educação Matemática” [Trends in Mathematics Education II: Sociopolitical Aspects in Mathematics Education] in the first semester of 2023 in a postgraduate course, we studied nine academic articles written by authors engaged with the teaching of mathematics for social justice, which, explicitly or implicitly, contained views on the concept of student agency. We had to investigate whether those authors addressed students’ agency considering whether and when their conceptions were still permeated by Eurocentric and colonized views. This critical analysis can be a way to promote a more inclusive, plural, and liberating mathematics education by contributing to breaking with the colonial structures that persist in the educational field.

Perceiving students as leaders in the educational process is essential to promote a political, social, and critical turn in mathematics education, understanding that they must not only learn mathematics but also become active and conscious participants. Thus, critically analyzing student agency aimed to provide valuable guidance to promote a more engaging, participatory, and socially responsible mathematics education. By understanding students' agency, one can discern how they express their expectations for change and contribute to a significant transformation in mathematics education, even in the face of limitations or challenges arising from initial teacher education. This perspective strengthens the importance of valuing the voice and participation of students as active agents in constructing an emancipatory and liberating mathematics education.

We hope this work contributes significantly to broadening the debate around student agency and inspires teachers, researchers, and educational policymakers to recognize and value active student participation to drive sociopolitical transformation in mathematics education. It is essential to divert paths that blame exclusively initial teacher education for the problems faced and the search for solutions. Instead, both the school and students must be considered as change agents. By recognizing students' agency and promoting emancipatory pedagogical practices, we will build a promising alternative in which they will be regarded as active subjects in constructing a more equitable, critical, and socially responsible mathematics teaching. This approach makes it possible to move towards a mathematics education that promotes social justice and the educational transformation necessary for a more inclusive future.

Methodological paths

This study is qualitative and starts with the selection and careful reading of academic articles that discuss the agency of students who may have been colonized, followed by a categorization process based on characteristics identified in them, followed by cross-sectional analysis, and ending with the nomothetic analysis (Fiorentini & Lorenzato, 2006). This process is characterized by critical analysis, which is an approach that seeks to understand and question the structures of power and domination that limit students' agency in mathematics education.

The first stage consisted of carrying out a detailed reading of the selected academic articles by mathematics educators that were brought for study in the curriculum component "Tendências em Educação Matemática II: Aspectos Sociopolíticos em Educação Matemática" [Trends in Mathematics Education II: Sociopolitical Aspects in Mathematics Education] during the first semester of 2023, aiming to identify the relevant characteristics related to the student's agency. Aspects such as the role attributed to the student in the teaching and learning process,

the perception of their capacity for self-direction and autonomy, and the consideration of their voice and active participation were key points for categorization.

Based on the identified characteristics, in the second stage, we carried out the emergent categorization of those articles. However, rather than imposing predefined categories, the categories were allowed to emerge naturally from the very data without rigid theoretical constraints. During this phase, we grouped the registered that shared similarities related to student agency, seeking to identify emerging patterns and themes.

The third stage consisted of a cross-sectional analysis of written registers collected at a specific time. This approach made it possible to examine them comprehensively and identify trends over time. With the cross-sectional analysis, a more complete view of mathematics educators' perceptions of student agency in the context of decolonial studies emerged.

Finally, we conducted a nomothetic analysis of the emerging categories in the fourth stage. This phase involved identifying broader patterns and relationships that could be generalizable to a wider population of mathematics educators. We sought to establish broader connections and understand how the colonized understanding of student agency is expressed and perpetuated.

By adopting the categorization process as a core methodology, along with cross-sectional analysis and the definition of emergent categories, the research aims to offer a more holistic and sensitive understanding of how coloniality emerges in the scholarly contributions of educators when interpreting student agency. This methodological approach enriches the discussion of more inclusive, emancipatory, and reflective pedagogical practices in mathematics education, valuing the diversity of perspectives and student experiences.

In search of decolonial concepts

A critical analysis of academic contributions is far-reaching in understanding how colonial structures manifest themselves and influence the concepts covered. This aspect becomes especially relevant in education and, more specifically, in the study of student agency, as one must examine how colonialism permeates the visions and definitions presented by these authors.

The presence of colonial elements in the writing of the selected articles constituted a crucial point of analysis to understand the complexity of the relations of power and domination present in education. Therefore, we must reflect on how these colonial perspectives can manifest themselves in the attribution of unequal roles and powers between teachers and students, in the reproduction of Eurocentric narratives that marginalize non-dominant

knowledge and perspectives, and in the limitation of possibilities for action and student participation due to oppressive power structures.

Student agency concerns students' ability to exercise autonomy, make decisions, and actively participate in learning. However, we must highlight that this agency is influenced by social, political, and cultural factors, which can restrict or strengthen its possibilities for action. Gutiérrez (2013, p. 46, our translation) states that the "significance of all these views is that the individual is greatly influenced and greatly influences the rules and institutions taken for granted in mathematics education."

Within the scope of the sociopolitical turn in mathematics education, Gutiérrez (2013) highlights the value of considering power dynamics, dominant discourses, and social structures that shape student agency. In this sense, she argues that adopting a critical perspective that reveals the power relations in social interactions is indispensable. According to the author:

Power is not the exclusive property of a group or imposed from the top down. The very language that was once used against my ancestors, I now use to challenge the politics of language. Again, individuals can play the game while changing it; apprentices and practitioners always do this. (Gutiérrez, 2013, p. 49, our translation)

Despite subordination, the student actively participates in the power game. In this way, students should not be considered only as passive recipients of knowledge or school practices but as active agents involved in the construction and negotiation of their identities and also in interactions with the world around them. Student agency is shaped by educational power relations, encompassing social norms, curricular structures, and teacher expectations. Gutiérrez (2013, p. 50-51, our translation) states, "When individuals are seen representing their identities and actively negotiating schooling, we can see the mathematics classroom as more than a place of enculturation or social reproduction."

Therefore, analyzing the presence of colonialisms regarding student agency in the selected articles becomes a priority for critically understanding education. This analysis allows us to identify and question the colonial influences in academic discourse, encouraging a deep reflection on overcoming these perspectives and building a more inclusive, equitable, and liberating education.

To achieve this, it is necessary to recognize the power dynamics and colonial relations that influence educational systems. Understanding the coloniality of power and knowledge emerges as a point to understand the student's agency and promote transformative education. Coloniality, in Walsh (2008, 2009, 2013, 2014), analyzes how colonial structures perpetuated hierarchies of power and subordination, affecting different spheres of social life, including

education. Those colonial structures establish relationships of domination and subalternization, adding to the agency of colonized subjects.

The coloniality of power can be materialized in the vertical relationship between teachers and students, in which the teacher is seen as the holder of knowledge and authority. Still, the student is forced into a submissive and passive position. According to Walsh (2013, p. 483, our translation), “In Latin America, the relationships, meanings, and practices derived from the concept of coloniality of power are articulated and promoted in the development discourse reproduced by formal systems of education, communication, cooperation, and innovation.”

This hierarchical dynamic can limit students’ active participation in decision-making regarding their own educational process. Oppressive power structures can grant those above the power relationship the feeling that they dominate a kind of access to the agency of the subjugated. Another impact of the coloniality of power on the construction of meaning regarding student agency is to impose a Eurocentric view of academic success and competence. Colonial structures tend to value Eurocentric standards of knowledge and skills, disregarding other forms of wisdom and talent in different cultures. This can lead to the marginalization of students who do not fit those standards, causing their agency to be compromised and diminished, as they may not feel recognized or valued in the school environment or even outside of it.

The coloniality of knowledge addresses how dominant knowledge is produced and legitimized, privileging Eurocentric epistemologies and marginalizing other forms of knowledge. This dynamic perpetuates inequalities and limits the possibilities of student agency by restricting the knowledge and perspectives valued in the educational context. For Walsh (2008, p. 137, our translation), “By crossing the field of knowledge, using it as a device of domination, coloniality penetrates and organizes epistemological, academic, and curricular frameworks.”

Thus, through Eurocentric perspectives, researchers tend to see student agency as a characteristic restricted to specific cultural contexts, marginalizing mathematical knowledge and practices from other cultures. This gaze can create a limited view of student agency, ignoring the different forms of student expression and participation in their own educational experiences, negotiating with hegemonic power in their own way. By reinforcing stereotypes and power hierarchies, researchers can portray students as passive and lacking agency, assuming that their participation in the learning process is limited and subordinate to the

teacher. This dynamic perpetuates power asymmetries, with the teacher as the holder of so-called legitimate knowledge and the student as inferior.

The coloniality of being, as discussed by Walsh (2008), focuses on the imposition of categories on bodies and their culture, being a path that leads to the denial of identities and epistemologies of subjugated groups. The coloniality of being can impact teachers' and students' self-esteem and self-image and lead them to internalize stereotypes and feel inadequate or insecure about their knowledge and cultural identity. Walsh (2008, p. 138, our translation) says that "the most human are those who are part of formal rationality –Weber's means-end rationality, which is the rationality of modernity conceived from the 'civilized' individual." The colonialism of being can be observed through cultural biases, reflected in the preference for ways of life and knowledge aligned with the dominant culture, in language that reflects Eurocentric views, in the creation of knowledge hierarchies that devalue non-Western perspectives, unequal treatment based in cultural origin, and expression of stereotypes and prejudices in relation to ethnic groups and cultures. Those behaviors can affect students' identity and self-image, creating an unequal and exclusionary learning environment.

Thus, understanding the faces of coloniality is essential to understanding students' agency. Recognizing the oppressive and unequal structures that permeate education allows us to question and challenge these dynamics, thus promoting students' autonomy and capacity for action.

Throughout this study, we carefully examined the texts by Gutstein (2007), Gutiérrez (2013), Goffeney, Gutiérrez and Boston (2018), D'Ambrósio (2011), Frankenstein (1983), and Valero (2012) to identify how colonialities manifest themselves in their approaches to student agency. This critical analysis was fundamental to understanding the complexities involved and developing strategies and practices that encourage inclusive, relevant, and liberating mathematics education.

Mathematics education for social justice

Authors interested in mathematics education aimed at the fight for social justice speak about student agency in a relatively coherent manner; still, in some moments of writing, we realize some contradictions in their understanding. Despite having in-depth knowledge about the topic, it is still possible to find passages in their writings that reflect aspects of colonization, placing the teacher hierarchically above the students. Some articles were selected to highlight nuances of this hypothesis, identifying different approaches concerning student agency in mathematics education and finding some contradictions.

We found registers in Gutstein (2007, p. 14, our translation) who, when writing about mathematics for social justice referring to students, drew attention: “Teachers who do not see their role as political activists (Freire, 1998) and do not build the political relationships with students that can support the development of their sociopolitical consciousness.” A possible interpretation of this excerpt would place the students in the submissive position of excluded people, oblivious to reality, and the educated teacher, as a consequence, above them. Would teachers be responsible for leading this student in the fight against their dominators? Or wouldn't teachers also be in the same situation as their students, hostages to the influence of their rulers?

In other words, Goffney, Gutiérrez, and Boston (2018, p. 1) show the need to provide students with windows and mirrors so that they can see the world through mathematics. According to them: “Every student must be provided with windows and mirrors to the world through mathematics (Gutiérrez, 2007, our translation).” So, can schools and teachers have these mirrors, or are they already placed in society? Do teachers help students observe a particular reflection, or do they come to class having already seen several of their reflections scattered throughout their lives and relationships? Are they the owners or builders of those (mathematical) windows, or can students also build them or bring them with them?

Those questions encourage educators to think a little more about the vertical teacher/student relationship and how the colonality of power and knowledge can perpetuate inequalities and marginalization in mathematics education. To some degree, all students may be systematically excluded or undervalued by schools and their teachers, resulting in less access to quality educational opportunities. Thus, while an approach guided by social justice seeks to identify and challenge these inequalities, we observe the opposite in those excerpts. This scenario denotes an element of analysis of discourse E1 (teacher-oppressor/student-oppressed relationship) about colonization, referring to students' agency dimension.

D'Ambrósio (2011, p. 211) considers that the student seems passive to the reality created by the dominator and again places school and teachers as entities capable of guiding them against and despite this domination. According to him: "Their reality is replaced by a situation that is idealized to satisfy the goals of the dominator. The student has their cultural roots, which are part of their identity, eliminated. This elimination produces the excluded." Believing that students do not deal with the issues put to them in the best way is what, in fact, places them as excluded. A teacher who believes this probably does not consider students a *tabula rasa*, as Freire would say, but may consider them a *tabula* full of negative social constructions that must be emptied so that teachers can fill it in again. The teacher takes the stance of a holder of students' "good" identity.

Also, Skovsmose (2019, p. 1) states that every student should feel complete. However, it is possible to argue that all social spaces are for power struggles, and schools are part of this. Still, he writes: "A student should be able to feel complete as a person, to use all of his or her cultural and linguistic resources, while participating in school mathematics." However, if the teacher, who already participates in school mathematics, cannot use all the resources and feel complete as a person, how can they expect anything different from their students? Would it be possible for a teacher or student to be complete as a person, or is incompleteness inherent in the construction of each person's continuous identity? Treating students as incomplete is another way of belittling who the student is by disregarding everything they experienced until they arrived in the classroom.

Coloniality can result in an approach to mathematics that privileges the knowledge and perspectives of the school and the teacher, neglecting other forms of knowledge and ways of thinking mathematically brought by students. Incorporating cultural diversity into mathematics education and valuing local knowledge may be the way to strengthen student agency, but it was not recorded in the previous excerpts. This scenario configures a second element of analysis E2 (student from a dominated culture) that was perceived from the observation about coloniality when looking at the student's agency dimension.

Frankenstein (1983, p. 321, our translation), when mentioning an application of Freire's theory in critical mathematical education, addressed, in a specific section, the student's capacity for participation and production. According to her writings, "Emancipatory content presented in non-liberating ways reduces critical insights to empty words that cannot challenge students' taken-for-granted reality and cannot inspire commitment to radical change." In his hypothesis, given the presentation format of a particular content, this directly implies a specific pattern of

answers. Emancipated participation and production could only emerge from emancipated environments. In this way, the teacher is responsible for creating the emancipatory guise of a given space or content, and the passive student reacts in a standardized way to this stimulus.

Skovsmose and Valero (2012, p. 7, our translation) debated the value of mathematics in producing selections, exclusions, and segregations when writing about the need to break political neutrality. Regarding the students' relationship with mathematics, the authors say that "Mathematics is a mystery to many, and they have been assigned the role of an "objective" judge, who decides who is or is not capable in society. (...) Mathematics education generates selection, exclusion, and segregation."

Thus, in the power struggle game in which possessing mathematical knowledge from the dominant culture is required, students are placed as passive. The strategies and subversions of this power struggle are not considered by the pair of writers, and the structure of domination is presented as an impossible game to win. Therefore, students would not be able to find strategies to master the mathematics expected by the ruling class.

The vertical relationship can inhibit students' active participation and collaboration in the construction of mathematical knowledge. Adopting a more horizontal approach based on dialogue, active listening, and student participation strengthens student agency, but the selected excerpts allow interpretation contrary to this meaning. This scenario results in the creation of the third element of discourse analysis, E3 (questioned participation), used to understand the colonized discourse about student agency.

When interpreting Freire, Frankenstein (1983, p. 319, our translation) suggests that without (school) education, people, including students, cannot achieve liberating social changes. In her words: "Freire considers education vital to help people become subjects involved in liberating social change."

A possible explanation would suggest a school with a redemptive bias disguised as a liberating bias. It would be the chance that the school gives the population to unveil dominating structures as if the school itself was not part of that same structure. For example, students cannot create situations, experience events, or negotiate solutions that place them in a similar position with teachers.

In the educational scenario, mathematics education guided by social justice involves a critical approach to systems of power and knowledge. This involves critically analyzing how mathematics has been used to perpetuate social, economic, and cultural inequalities but seeking

ways to use mathematics as a tool for empowerment and social transformation. However, the scenario analyzed places people who do not access formal education as incapable of building a critical view of the mathematical elements that reveal society in its power struggles. Therefore, this is the fourth element of discourse analysis, E4 (critical passivity), observed when analyzing colonialisms regarding the student's agency dimension.

A particular case appears in Barwell (2018, p. 158, our translation), who, when dealing with mathematical education for a sustainability agenda, reinforces the redemptive character of the school in the concluding excerpt of the text: "We must be realistic: mathematics education will not save the world, but it can help shape the citizens of the future who will." Barwell has a well-formed idea of what it means to "save the world" and who you are fighting against. Is it the same connection the student makes with the environmental reality surrounding them? Or would Barwell's vision be big enough to encompass all other desires and understandings about this idea of saving the world?

Mathematics education guided by social justice seeks to establish connections between mathematical concepts and students' everyday lives, relating mathematics to real problems, social contexts, and justice issues. On the contrary, the highlighted scenario considers that the school provides the student with a vision of the structures that shape reality, and the student would be prepared to modify them. Thus, the last element of discourse analysis starts from this reported scenario, with E5 (disconnections with reality) being another point to understand the agency dimension of the student crossed by colonialism.

Batthey and Leyva (2016, p.61, our translation) discuss the topic of whiteness from the perspective of mathematics education, stating that "schools are key sites of identity formation through processes of racial attribution that distinguish whites from non-whites using markers of otherness." To some extent, the authors seem to detach schools and universities from the reality that composes them. However, it is necessary to consider that school is a relevant place for the construction of identity because the student and the teacher spend a lot of time within it, although the power struggle at school is an extension of what occurs in several other spaces. In this case, academic knowledge becomes a weapon for negotiating how one perceives one's body and its connection with one's history and ancestry.

Given this, if we think that access and understanding of academic tools are sufficient and necessary to unveil the influences of colonialism, then it is possible to understand the student, who has not yet had access to academic knowledge of the struggles against this

domination, having their identities designed and constructed by third parties. The highlighted scenario considers that the school and the teacher are links capable of connecting the individual and their identity construction process to their nature and ancestries, disregarding other educational spaces and power negotiation strategies arising from students themselves, including when accepting or denying the very academic knowledge. This scenario converges to the sixth and final element of discourse analysis E6 (disconnection with one's own identity), observed in our research to understand the colonized discourse about student agency.

The previously mentioned elements of discourse analysis (E1, E2, E3, E4, E5, and E6) were considered devices to identify and analyze certain aspects of the student's agency in the educational context. These analytical tools help examine the dynamics of knowledge and power that may be present in discussions that use student agency. However, it is crucial to remember that using these elements of discourse analysis does not imply that all the authors mentioned above or those yet to be analyzed share these colonial perspectives or that these are the only ways of interpreting their speeches. We must remain vigilant regarding colonial issues and always consider how colonialism can influence one's relationships with knowledge and with each other.

This critical analysis is configured as a continuous and interpretative process, subject to different perspectives and interpretations. Therefore, it is always relevant to critically examine colonial issues and be receptive to various interpretations and voices, especially regarding complex concepts like student agency.

Final considerations

This study analyzed works by renowned mathematics education authors discussing student agency to understand how colonial structures manifest themselves and influence the concepts covered. Critical analysis revealed nuances and contradictions in the authors' perspectives, pointing to colonial elements related to student agency.

The excerpts analyzed revealed that even authors engaged in the fight for social justice in mathematics education can reproduce hierarchical and oppressive views concerning students. The presence of colonialism regarding students' agency was identified in different aspects, including attributing power and authority to the teacher, reproducing Eurocentric narratives, and limiting students' possibilities for action and participation.

The coloniality of power, knowledge, and being emerged as crucial in understanding those colonial dynamics. Colonial structures perpetuate hierarchies of power and subordination, restricting students' agency and marginalizing other forms of knowledge and perspectives. Analyzing those colonial influences in academic discourse allows for in-depth questioning and reflection on overcoming such perspectives and building a more inclusive, equitable, and liberating mathematics education.

Given this reality, it is essential to recognize the power dynamics in educational systems and question the relationships of domination that impact student agency. An approach guided by social justice seeks to value and incorporate cultural diversity in mathematics education, thus promoting students' active participation and collaboration in constructing knowledge.

We must rethink traditional educational practices and question power inequalities and hegemonic narratives in mathematics education. Students must be recognized as active agents, capable of exercising their agency and contributing to constructing a fairer society.

The critical analysis conducted in this study allowed us to identify elements of colonialism relating to student agency in the works of the analyzed authors. However, it is important to highlight that these elements of analysis should not be seen as a generalization of the authors' perspectives, nor as the only ways of interpreting their works, as this is an interpretative process subject to different perspectives and narratives.

Given this, it is essential to remain vigilant about colonial issues and be receptive to a plurality of voices and interpretations. Student agency is a complex concept that requires careful and critical analysis, considering power relations and the pursuit of inclusive, relevant, and liberating mathematics education.

Researchers and educators are responsible for questioning and challenging the oppressive structures in education, aiming to promote a critical and reflective approach. We must constantly seek new ways to promote student agency, valuing their experiences, perspectives, and knowledge and working to build an educational environment that is truly inclusive, equitable, and empowering.

Therefore, the critical analysis of the presence of colonialism on student agency in the works of these famous authors analyzed in this study highlights the need for continuous engagement in the fight for a fairer and more liberating mathematics education. Deconstructing

colonial structures is a complex challenge, but it is a fundamental step toward promoting student agency and transforming education into a space of empowerment and equal opportunity.

References

- Barwell, R. (2018). Some thoughts on a mathematics education for environmental sustainability. *The philosophy of mathematics education today*, 145-160.
- Battey, D. & Leyva, L. A. (2016). A framework for understanding whiteness in mathematics education. *Journal of Urban Mathematics Education*, 9(2).
- Boaler, J. & Greeno, J. G. (2000). Identity, agency, and knowing in mathematics worlds. *Multiple perspectives on mathematics teaching and learning*, 1, 171-200.
- Boaler, J. (2015). *Mathematical mindsets: Unleashing students' potential through creative math, inspiring messages and innovative teaching*. John Wiley & Sons.
- D'Ambrosio, U. (2011). A busca da paz como responsabilidade dos matemáticos. *Cuadernos de investigación y formación en educación matemática*.
- Lorenzato, S. (2006). *Investigação em educação matemática percursos teóricos e metodológicos*. Autores associados.
- Frankenstein, M. (1983). Critical mathematics education: An application of Paulo Freire's epistemology. *Journal of Education*, 315-339.
- Goffney, I., Gutiérrez, R. & Boston, M. (2018). *Rehumanizing mathematics for Black, Indigenous, and Latinx students*. National Council of Teachers of Mathematics.
- Gutiérrez, R. (2013). The sociopolitical turn in mathematics education. *Journal for research in mathematics education*, 44(1), 37-68.
- Gutstein, E. (2009). Possibilities and challenges in teaching mathematics for social justice. *Critical issues in mathematics education*, 351-373.
- Mendes, M. I. (2022). *A pesquisa em Educação Matemática alinhada com a Justiça Social: aproximações com a Educação em Direitos Humanos*.
- Freire, P. (1971). *Pedagogia do oprimido*.
- Reis, A. C. & Esquinalha, A. (2022). *Por uma virada sociopolítica: a importância da discussão sobre gêneros e sexualidades nas aulas e na pesquisa em (Educação) Matemática*.
- Skovsmose, O. & Valero, P. (2012). *Rompimiento de la neutralidad política: el compromiso crítico de la educación matemática con la democracia*.
- Skovsmose, O. (2019). *Inclusões, encontros e cenários. Educação Matemática em Revista*, 24(64), 16-32.

- Walsh, C. (2009). *Interculturalidad, estado, sociedad*. Universidad Andina Simón Bolívar, Sede Ecuador: Abya-Yala.
- Walsh, C. (2008). Interculturalidad, plurinacionalidad y decolonialidad: las insurgencias político-epistémicas de refundar el Estado. *Tabula rasa*, (9), 131-152.
- Walsh, C. (2013). Pedagogías decoloniales. Prácticas insurgentes de resistir, (re) existir y (re) vivir. *Serie "Pensamiento decolonial" de Ediciones Abya Yala Quito, Ecuador*.
- Walsh, C. (2014). Lo pedagógico y lo decolonial: entretejiendo caminos en Walsh, C. *Pedagogías Decoloniales Quito: Ediciones Abya-Yala. Tomo IP*, 19-68.