


Ethnic-racial relations in chemistry teaching in adult education: a literature review

ARTICLE

Rômulo Henrique Possatte Martinsⁱ 

Instituto Federal do Espírito Santo, Vila Velha, ES, Brasil

Mari Inez Tavaresⁱⁱ 

Departamento de Teorias do Ensino e Práticas Educacionais, Universidade Federal do Espírito Santo, Vitória, ES, Brasil

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Abstract

The research, based on authors who discuss popular education, social justice and decolonial curriculum, aimed to identify academic productions that articulate the teaching of chemistry with education for ethnic-racial relations in Youth and Adult Education. An integrative literature review was carried out, focusing on articles published in national journals in the areas of education and science/chemistry teaching. The results reveal a scarcity of studies that integrate these dimensions, although they indicate that teachers recognize the importance of the topic. However, pedagogical implementation faces obstacles, such as the lack of continuing training and the shortage of suitable materials. When present, anti-racist practices value students' experiences and encourage critical engagement. We conclude that it is necessary to encourage research and training that promotes contextualized, critical and inclusive approaches in chemistry teaching aimed at this audience.

Keywords: Youth and Adult Education. Education for Ethnic-Racial Relations. Academic Collection.

As relações étnico-raciais no ensino de Química na EJA: uma revisão bibliográfica

Resumo

A pesquisa, fundamentada em teóricos que discutem educação popular, justiça social e currículo decolonial, teve como objetivo identificar produções acadêmicas que articulem o ensino de Química à educação para as relações étnico-raciais na Educação de Jovens e Adultos. Foi realizada uma revisão integrativa da literatura, com foco em artigos publicados em periódicos nacionais das áreas de Educação e Ensino de Ciências/Química. Os resultados revelam escassez de estudos que integrem essas dimensões, embora indiquem que docentes reconhecem a importância do tema. No entanto, a efetivação pedagógica enfrenta obstáculos, como a ausência de formação continuada e a carência de materiais adequados. Quando presentes, as práticas antirracistas valorizam as vivências dos estudantes e favorecem o engajamento crítico. Conclui-se que é necessário fomentar pesquisas e formações que promovam abordagens contextualizadas, críticas e inclusivas no ensino de Química voltado a esse público.

Palavras-chave: Educação de Jovens e Adultos. Educação das Relações Étnico-raciais. Acervo Acadêmico.

1 Introduction

The enactment of Laws No. 10,639/2003 and No. 11,645/2008 represented a milestone in Brazilian education by making the teaching of Afro-Brazilian, African, and Indigenous Peoples' History and Culture mandatory. These regulations have promoted more inclusive pedagogical practices, promoting the appreciation of the contributions of black and Indigenous peoples, as well as challenging the Eurocentric hegemony that has historically permeated school curricula and the construction of knowledge in the country.

In this scenario, Youth and Adult Education (EJA) presents itself as a modality that directly dialogues with the black population, historically marginalized by the educational system. The marks left by the slave trade and by an elitist logic that structured education in Brazil still sustain policies that maintain inequalities, as pointed out by Mascarenhas (2021).

Given this, this study starts from the question: what do academic works that deal with ethnic-racial relations in chemistry classes in EJA reveal? What productions underpin these pedagogical practices and how can racial issues, articulated with chemistry content, contribute to the teaching-learning process of individuals who did not complete their studies at the expected age and are now enrolled in EJA?

To answer these questions, an integrative review of the literature was conducted, analyzing scientific works available in journals and databases, seeking to understand how chemistry teaching in EJA has incorporated education for ethnic-racial relations. The analysis was guided by the legal framework for education — in particular, the Law of Guidelines and Bases for National Education (LDB — Law No. 9,394/1996), as well as Laws No. 10,639/2003 and No. 11,645/2008 — and by theoretical references, such as Freire (1987, 1992, 2011), Paiva (2015), Verrangia and Santos (2010).

Thus, the objective of this study is to identify and analyze academic studies that address ethnic-racial relations in the teaching of chemistry within the context of Youth and Adult Education, seeking to understand how such approaches have been constructed and what impacts they have on the educational process of historically excluded subjects.

1.1 Youth and Adult Education: some historical aspects, connection with Paulo Freire, and profile of students in this modality

In the historical and educational development of Brazil, Youth and Adult Education has been marked by contradictions, discontinuities, and ideological disputes, especially between emancipatory and social control projects.

Initially, during Colonial Brazil (1550-1822), education was offered to Indigenous peoples by the Jesuits and aimed at catechization, as this favored the process of Portuguese colonization; however, literacy was not considered very important (Conte, 2021).

During the Brazilian Imperial period (1822-1889), primary education was introduced for all citizens who were part of the elite. Despite this, the need for labor led to the creation of schools focused on teaching workers to read and write so that they would know their rights and duties and be civilized. Starting with the First Republic (1889-1930), several projects were institutionalized, but many were not implemented. During this period, due to the high illiteracy rate among the adult population, night schools were created with the aim of enabling this population to acquire the right to vote, which was manipulated in favor of the interests of the ruling classes (Deon, 2024).

During the Vargas Era (1930-1945), adult education was aimed at training skilled labor for industry and commerce. In 1942, the National Primary Education Fund (FNEP) was created to promote literacy among the illiterate population, including supplementary education for adults. Thus, EJA underwent significant advances, even if aligned with interests for industrial development (Haddad; Di Pierro, 2000; Escobar, 2007; Paiva, 2015).

During the Populist Period (1946-1964), the 1st Law of Guidelines and Bases (1961) was enacted, which favored the expansion of popular education movements and, consequently, highlighted EJA. In 1947, the Adolescent and Adult Education Campaign (CEAA) was created with the aim of improving Brazil's illiteracy rate in relation to global statistics. Despite some positive results, such as a change in attitudes towards illiterate

adults, and criticism of the literacy method used, the campaign declined in 1963 (Soares, 2004; Paiva, 2015).

During this time, a movement emerged that was critical of the precarious state of school facilities, teaching materials, and teacher training, suggesting pedagogical innovations related to raising awareness among the lower classes and developing a critical, political, and social consciousness that would enable the people to participate actively as citizens. It is in this line of thinking that Paulo Freire, recognized to this day as one of the leading names in popular education and EJA, structured his pedagogical practice based on dialogue and the valorization of the socio-historical perspective of students (Freire, 1992).

By encouraging a critical reading of the world, his approach promoted the development of students' social and political awareness. One of his most emblematic experiences was the literacy of 300 adults in just 40 hours — an episode known as “40 hours of Angicos.” However, with the military dictatorship between 1964 and 1985, education underwent a process of ideological indoctrination, becoming more rigid and conservative. In this context, adult literacy took on a welfare and technical character — notably the Brazilian Literacy Movement (Mobral), which existed from 1967 until the end of the regime in 1985, which broke away from Freire's ideas of critical thinking and emancipation, reproducing the interests of the military government (Freire, 1992; Paiva, 2015).

In the New Republic (1985 to the present), Youth and Adult Education began to occupy a greater space in discussions about the right to education. This was particularly true with the Federal Constitution of 1988, which reaffirmed education as a right for all and a duty of the state, paving the way for the regulation of EJA. However, despite legal achievements, the modality continued to face structural and symbolic obstacles, such as the lack of adequate funding, the precariousness of supply conditions, and the welfare-based view that often surrounds it (Brasil, 1988; Paiva, 2015).

Currently, Youth and Adult Education (EJA) is a type of education intended for elementary and high school levels, established by the 1996 Law of Guidelines and Bases

for National Education (LDB). This modality serves a population composed of young people and adults who, for different reasons, had to interrupt their schooling at the expected age. Among these factors, socioeconomic issues stand out, often forcing individuals to prioritize work to support their families (Costa *et al.*, 2020). Thus, EJA is aimed at students who, after a long period away from school and generally already in the labor market, seek to resume their studies in the evening as a way to access knowledge and continue their education. Currently, the minimum age to attend EJA for elementary school is 15 years old and for high school is 18 years old. The LDB expresses this understanding in its Article 37, as quoted below:

Art. 37. Youth and adult education shall be intended for those who did not have access to or continuity of studies in elementary and high school at the appropriate age.

§1º Education systems shall ensure that young people and adults who were unable to complete their studies at the regular age are provided with appropriate educational opportunities, taking into account the characteristics of the student body, their interests, living and working conditions, through courses and exams.

§2 The government shall enable and encourage workers' access to and retention in school through integrated and complementary actions (Brasil, 1988).

The student composition of this modality is also linked to people of African descent. The history of both is convergent, as they are precisely the part of the population that had their rights denied when trying to access the educational process (Oliveira; De Resende Ferreira, 2019; Silva; Moura; Santos, 2021).

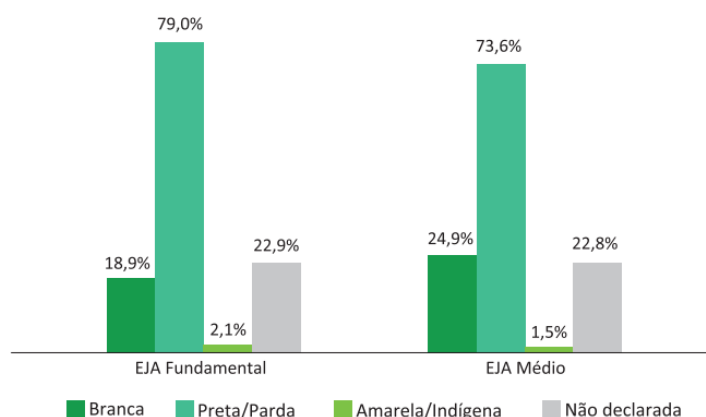
Santos (2012, p. 153) states that:

It is possible to see how much the Brazilian state has forged and legally standardized the exclusion of the black population from educational policies. The construction of educational inequalities, whether in the legislative sphere or in the absence of full material conditions for the exercise of rights, is still reflected today in indicators of illiteracy, school failure, and dropout rates, as well as in the profile of the EJA (Youth and Adult Education) audience. Therefore, this reality was constructed during the transition period from slave labor to free labor in the 19th century, reaching enormous proportions of educational and social inequalities in the 20th century.

And even today, this population is the most concentrated in this modality. Figure 1 shows that, according to the graph contained in the 2022 School Census produced by Inep, the percentage of enrollments in EJA is predominantly black, both in elementary school (77.5%) and high school (63.9%).

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Figure 1 – Percentage of enrollments in Youth and Adult Education at the elementary and high school levels, according to color/race, in 2024



Source: prepared by Deed/Inep based on data from the Basic Education School Census (2025).

The National Curriculum Guidelines (DCNs) for Youth and Adult Education state that:

Youth and Adult Education (EJA) represents an unrepaired social debt to those who did not have access to or mastery of writing and reading as social assets, in school or outside of it, and who were the workforce employed in the creation of wealth and the elevation of public works. Being deprived of this access is, in fact, the loss of an essential tool for a meaningful presence in contemporary social life (Brasil, 2000, p. 5).

Thus, the DCNs ratify a historical and social reparation resulting from the impediment to full citizenship, which descendants of enslaved black people and Indigenous people have suffered – and continue to suffer to this day. In this context, EJA presents itself as a fundamental instrument in enabling access to education. That said, the document

claims that EJA assumes three functions: reparative, as a means of repairing a right previously denied to citizens; equalizing, by allowing re-entry into the educational system, enabling access, permanence, and learning; and qualifying, in the recovery of learning and qualification, with the purpose of enabling citizens to live adequately in society in an active, participatory, and productive manner (Brasil, 2000).

These functions are in line with Freire's practice, since, according to Almeida, Fontenele, and Freitas (2021, p. 6), "[...] envisioning an inclusive, integrative education, where educational spaces and proposals must be prepared in all aspects to welcome students, effectively promoting a liberating education based on their curriculum."

Thus, in this modality, it is necessary to consider what students bring with them in terms of practical knowledge, so that it can be interpreted, transposed, and transformed into scientific-theoretical knowledge and, subsequently, critically thought about in relation to their social reality.

1.2 Ethnic-racial relations education (ERER): conceptualization, Laws 10.639/03 and 11.465/08, and interfaces with EJA and the teaching of chemistry

Ethnic-racial relations can be understood, according to Verrangia and Silva (2010), as "those established between different social groups, and between individuals within these groups, informed by concepts and ideas about the differences and similarities relating to the racial belonging of these individuals and the groups to which they belong." When discussing the socio-historical construction of Brazil, these relations refer to the African, Native-Indigenous, and European populations and their miscegenation, which constitute the Brazilian people. Ethnic-racial education can be described as a potential tool for deconstructing historically prevailing racist policies. Silva (2008, p. 490) describes that:

Ethnic-racial relations education aims to educate citizens, women, and men committed to promoting conditions of equality in the exercise of social, political, and economic rights, as well as the rights to be, see, and think, specific to different ethnic-racial and social affiliations.

According to the LDB (1996), schools have a role in educating citizens. In accordance with Article 2, education should be provided by families and the state, based on the idea of freedom and human solidarity, so that students can develop and exercise citizenship (Brasil, 1996). Although this exercise was guided, it was only with Law No. 10,639/2003 that there was a categorical public policy explicitly aimed at recognizing racial diversity in education — the work of the Brazilian black movement, which fought hard for this achievement. Thus, the theme “Afro-Brazilian History and Culture” was included as a mandatory subject in the official school curriculum.

In public and private elementary and secondary schools, teaching Afro-Brazilian History and Culture became mandatory.

§ 1 The program content referred to in the *caput* of this article shall include the study of the History of Africa and Africans, the struggle of black people in Brazil, Brazilian black culture, and black people in the formation of national society, highlighting the contribution of black people in the social, economic, and political areas relevant to the History of Brazil.

§ 2 The content related to Afro-Brazilian history and culture shall be taught throughout the school curriculum, especially in the areas of Art Education and Brazilian Literature and History (Brasil, 2003).

The aim is, therefore, to enhance the image of African and Afro-Brazilian peoples by bringing to the classroom a faithful account of the history of Africa, the real process of slavery in Brazil, and false racial democracy, thus promoting a decolonial vision in contrast to the Eurocentric knowledge rooted in curricula, enabling the construction of positive references to black history.

Five years later, Law No. 11,645/2008 was enacted, amending the previous law to include topics related to Indigenous history and culture. Thus, the subject “Afro-Brazilian and Indigenous History and Culture” became mandatory in the official curriculum.

In public and private elementary and high schools, the study of Afro-Brazilian and Indigenous history and culture is now mandatory.

§ 1 The program content referred to in this article shall include various aspects of the history and culture that characterize the formation of the Brazilian population, based on these two ethnic groups, such as the study of the history of Africa and Africans, the struggle of black people and Indigenous peoples in Brazil, black and Indigenous Brazilian culture, and black and Indigenous peoples in the formation of

national society, highlighting their contributions in the social, economic, and political areas relevant to the history of Brazil.

§ 2 Contents related to Afro-Brazilian history and culture and that of Brazilian Indigenous peoples will be taught throughout the school curriculum, especially in the areas of arts education and Brazilian literature and history (Brasil, 2008).

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These changes enable the recovery of the knowledge of peoples historically subjugated by epistemic racism and the colonization of knowledge. According to Oliveira and Brindeiro (2018), the regulation of these laws represents the main instrument of anti-racist struggle in education.

However, although there is a large presence of black students in EJA, this does not guarantee the adequate treatment of racial issues in pedagogical processes. For Passos and Santos (2018), anti-racist education must occur regardless of the racial composition of the class, overcoming the European cultural matrix inherited from the colonial and elitist model that marked Brazilian historical and educational formation.

Although Freire (2011) does not directly discuss ethnic-racial education, his defense of the recognition of students' cultural identities provides a basis for EJA to address experiences of racial exclusion and promote the construction of positive identities. Linking content to the reality of the learner encourages critical reflections on racism and confronting its logic of inferiority, enabling the construction of a positive identity and modifying the process of inferiority that racism has promoted and continues to promote towards black people. Recognizing the trajectory of these subjects is essential for teaching practice, as each student's culture is a fundamental proposition in the interconnection between their socially acquired knowledge and what the school can provide. Therefore, this cultural background should be the bridge between socially acquired knowledge and school knowledge, preventing disinterest, conflicts, and dropouts (Gadotti; Romão, 2001).

However, the Natural Sciences still operate under a Eurocentric logic, reinforced by the centrality of the scientific method, which marginalizes African and Amerindian knowledge, treated as proto-science (Mascarenhas, 2021). Alves Mendes, Costa da Silva, and dos Reis (2022) affirm that structural racism permeates curriculum guidelines, validating their content and themes to be addressed; thus, it interferes with school

trajectories by erasing non-hegemonic approaches and undermining critical thinking beyond the Eurocentric view. As a result, there are very few connections between concepts in science subjects and African and Amerindian scientific productions.

Science teaching has little focus on knowledge related to ethnic and racial issues, as the concept of science stems from modernity, which does not view black people as holders of knowledge or wisdom. As a result, all production originating from African peoples is invalidated, hindering debates about ethnic and racial relations in chemistry teaching. Science teaching methods are incapable of acknowledging the existence of other epistemes, as well as deconstructing the monolithic nature of educational proposals. Notably, traditional and popular knowledge are not recognized as reliable forms of validation of scientific models, which are later transformed into academic models (Alves, Costa da Silva, Dos Reis, 2022, p. 6).

A decolonial way of promoting discussions about ethnic-racial relations in chemistry teaching involves contextualization, provoking reflections that enable a critical understanding of reality, using African, African-American, and Amerindian history and culture, which can be articulated with students' knowledge and the chemical contents. Examples include steel forging, medical processes such as bone setting, knowledge of anesthetic, healing, and poisonous substances, the “depoisoning” of foods such as cassava, and the mummification process (Freire, 2011; Soetgen; Hilbert, 2016; Pinheiro, 2021).

2 Methodology

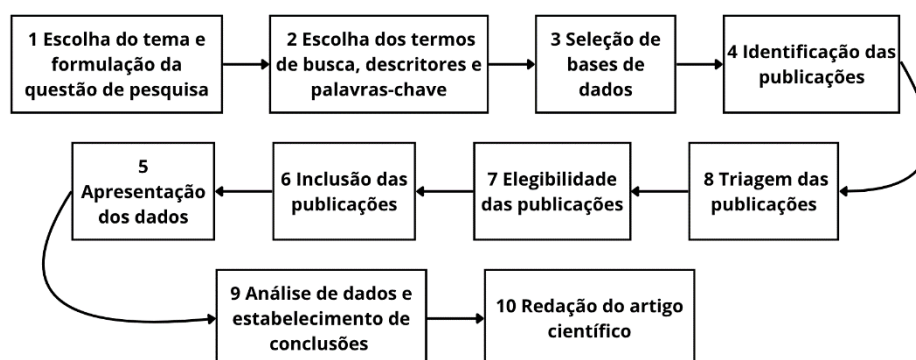
The methodology that guides this article is structured as an integrative review, qualitative in nature and bibliographic in type, collecting works from the literature included in databases to produce results. Fonseca (2002, p. 32) states that bibliographic research:

[...] is based on a survey of theoretical references that have already been analyzed and published in written and electronic media, such as books, scientific articles, and web pages. Any scientific work begins with a bibliographic search, which allows the researcher to learn what has already been studied on the subject. However, there are scientific studies that are based solely on bibliographic research, seeking published theoretical references with the aim of gathering information or prior knowledge about the problem for which an answer is sought.

The research was conducted through an integrative review which, according to Souza, Silva, and Carvalho (2010, p. 103), is understood as a way of determining “current knowledge on a specific topic, since it is conducted in order to identify, analyze, and synthesize the results of independent studies on the same subject.” Figure 2 shows the step-by-step process of conducting an integrative review and the procedures performed in this research.

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Figure 2 – Step-by-step guide to conducting integrative research



Source: adapted from Hassunuma *et al.* (2023).

Thus, a literature search was conducted in databases and journals associated with entities such as graduate programs at public universities and institutions focused on the dissemination of knowledge, described in Table 1.

These journals are registered in the CAPES quadrennial evaluation (2017-2020) in the areas of teaching, education, and chemistry. Journals related to graduate programs in Science Teaching/Education at public universities were selected, as well as journals related to the word “Diversity” found in the Sucupira Platform search with Education as the key area, as well as important databases, such as the Brazilian Digital Library of Theses and Dissertations and CAPES Journal, and renowned journals in the field of Chemistry Teaching, namely: *Química Nova na Escola*, *Revista Brasileira de Ensino de Ciência e Tecnologia*, *Revista da Sociedade Brasileira de Ensino de Química*, and *Revista Debates em Ensino de Química*. The *Revista da Associação Brasileira de Pesquisadores(as) Negros(as)* (ABNP) was also added, given its importance in promoting black authors.

Table 1 – Selected databases/journals

Code	Database/Journal
BD1	Brazilian Digital Library of Theses and Dissertations (BDTD)
BD2	CAPES Journal
P1	<i>Química Nova na Escola</i>
P2	<i>Revista Brasileira de Ensino de Ciência e Tecnologia</i>
P3	<i>Revista da Sociedade Brasileira de Ensino de Química (ReSBEnQ)</i>
P4	<i>REDEQUIM – Revista Debates em Ensino de Química (REDEQUIM)</i>
P5	<i>AMAZÔNIA: Revista de Educação em Ciências e Matemáticas</i>
P6	<i>Revista Eletrônica ARETÉ (Manaus) – Revista Amazônica de Ensino de Ciências</i>
P7	<i>Revista Interdisciplinar em Ensino de Ciências e Matemática (RIEcim)</i>
P8	<i>Revista de Ensino de Ciências e Matemática (REnCiMa)</i>
P9	<i>Revista Educação, Ciências e Matemática (RECM)</i>
P10	<i>Revista Eletrônica Scientia Naturalis</i>
P11	<i>Revista Vivências em Ensino de Ciências</i>
P12	<i>Revista Brasileira de Educação em Ciências e Educação Matemática</i>
P13	<i>ACTIO: Docência em Ciências</i>
P14	<i>Revista Rede Amazônica de Educação em Ciências e Matemática (REAMEC)</i>
P15	<i>Revista Ensino, Saúde e Ambiente</i>
P16	<i>Revista Brasileira de Ensino de Ciências e Matemática (RBECM)</i>
P17	<i>Revista Eletrônica Debates em Educação Científica e Tecnológica</i>
P18	<i>Revista Acta Scientiae</i>
P19	<i>Revista Dynamis</i>
P20	<i>#Tear: Revista de Educação, Ciência e Tecnologia</i>
P21	<i>Alexandria: Revista de Educação em Ciência e Tecnologia</i>
P22	<i>Ensino de Ciências e Tecnologia em Revista (ENCITEC)</i>
P23	<i>Revista Brasileira de Pesquisa em Educação em Ciências</i>
P24	<i>Revista Científica do Departamento de Química e Exatas (Exatas Online)</i>
P25	<i>Experiências em Ensino das Ciências (EENCI)</i>
P26	<i>Investigações em Ensino de Ciências (IENCI)</i>
P27	<i>Revista Brasileira de Pesquisa em Educação em Ciências (RBPEC)</i>
P28	<i>Revista da Associação Brasileira de Pesquisadores(as) Negros(as) (ABNP)</i>
P29	<i>Revista Diversidade & Educação</i>
P30	<i>Revista de Estudos em Educação e Diversidade (REED)</i>
P31	<i>Revista Povos, Diversidade e Educação</i>

Source: Authors (2025).

Several keywords were used to search for articles, dissertations, and theses, such as: ethnic-racial relations, Law 10.639/03, Law 11.645/08, Ethnochemistry, Chemistry, EJA, and Youth and Adult Education. For the databases, search descriptors were created using combinations of the keywords described above to facilitate the process.

The criteria used to define the selected works were: studies published electronically, articles in Portuguese, which were not bibliographic reviews, there was no time limit – considering that Law No. 10.639/03 recently marked its 22nd anniversary and that works related to it have been published more frequently only in recent years (Santos, 2021) –, studies that exclusively relate the interaction between EJA, ERER, and chemistry. To meet this last criterion, the keywords and methodology of the articles were read.

Braun and Clark's (2006) Thematic Analysis was used as a means of analysis, a method used to identify, analyze, interpret, and report patterns (themes) from qualitative data. The thematic categories determined *a priori* are: a) Teacher Perceptions – which bring together works that express the ERER relationship in chemistry classes in EJA – and b) Pedagogical Practices – activities proposed or applied in the classroom that portray the ERER and chemistry relationship in EJA.

3 What do the articles say about ethnic-racial relations in chemistry teaching in EJA?

The results of the review show that ethnic-racial relations in chemistry teaching in the Youth and Adult Education modality are still rarely addressed. Four works were found that explicitly address the topic.

The studies identified and what each one addresses are explained in Table 2, along with their authors and thematic classifications.

Table 2 – Studies addressing RER in chemistry teaching in EJA

Thematic Categories	a) Teacher perceptions		b) Teaching Practices	
Title of the work	Evidence of a (De)Colonial Perspective in the Discourse of Chemistry Teachers: Challenges and Contributions in Education for Ethnic-Racial Relations	Evidence of a (De)Colonial Perspective in the Discourse of Chemistry Teachers on Ethnic-Racial Relations	Design of Historical Case Studies for Ethnic-Racial Relations: Contributions to Chemistry Teaching	Education for Ethnic-Racial Relations in the Teaching and Training of Chemistry Teachers: Implications of the Field of Study on Whiteness
Author(s) and Year	Cardoso (2019)	Cardoso and Pinheiro (2021)	Santos, Santos, and Cabral (2022)	Gonzaga and Gonçalves (2024)
Database/Periodicals	BD1	P28	P30	P1
What do they address?	The perspective of chemistry teachers when portraying ethnic-racial relations in their classes.		Proposal to apply case studies on the coronavirus to discuss racial issues.	Proposal to apply teaching sequences, one in basic education, portraying whiteness and working with the melanin molecule and diverse chemical concepts; and another in higher education, addressing whiteness and doing science.

Source: Authors (2025).

Within the first category, Silná Maria Batinga Cardoso reports, both in her dissertation “Evidence of a (De)Colonial Perspective in the Discourse of Chemistry Teachers: Challenges and Contributions in Education for Ethnic-Racial Relations,” from 2019, and in the article entitled “Evidence of a (De)Colonial Perspective in the Discourse of Chemistry Teachers on Ethnic-Racial Relations,” published with her advisor, Barbara Carine Pinheiro Soares Pinheiro, in 2021, the perceptions of two teachers who teach chemistry at the Reference Center for Youth and Adult Education in Aracaju/SE in relation to the theme of race in chemistry education. The teachers in question are: a 40-year-old

black woman, who graduated in 2010, has been teaching for 18 years, and has been teaching at EJA for 2 years; and a 57-year-old black man, who graduated in 1986, has been teaching for 30 years, and has been working at EJA for 5 years.

Through semi-structured interviews and the Discursive Textual Analysis (DTA) methodology, it was noted that teachers attach importance to the issue based on personal experience. Thus, when discussing their knowledge, understanding, and implementation of Law No. 10,639/03, it was noted that both were aware of the law, but its application is somewhat more difficult, requiring training and political commitment to be effective. Regarding their perceptions of racism, both recognize its existence and also that they have been affected by it in some way during their lives. With regard to the decolonial curriculum, both parties have already addressed African and Afro-Brazilian scientific production in the classroom. When it came to affirmative action, there was a divergence, as the female teacher recognized the inequality based on race, promoting the need for racial quotas, while the male teacher disagreed, based on the meritocratic fallacy.

Thus, the female teacher's discourse is closer to decolonial, while the male teacher's is closer to colonial. Even so, racism itself is not addressed in the classroom, so there is a clear need for continuing education that promotes Law No. 10,636/03, not only for chemistry teachers, but for everyone.

Cardoso's studies (2019; 2021) discuss the lack of articulation between theory and practice, regardless of knowledge about the importance and effectiveness that education for ethnic-racial relations should assume. This is due to the absence of specific training; the lack of adequate teaching materials also appears as one of the main obstacles. Arroyo (2006) and Gadotti and Romão (2001) highlight the need for pedagogical practices that recognize the life stories and ethnic-racial trajectories of EJA students, in order to overcome the prejudiced logic of Brazilian education.

Considering the second theme, the article by Jucimara de Jesus Santos dos Santos, Paloma Nascimento dos Santos, and Patrícia Fernanda de Oliveira Cabral (2022), "Design of Historical Case Studies for Ethnic-Racial Relations: Contributions to Chemistry

Teaching,” discusses the creation of historical cases that foster discussions involving ethnic-racial relations and chemistry concepts.

The authors selected the theme “Sars-CoV-2 pandemic,” as it is a recent historical event, to construct their propositions. They used news reports in the media as a source of inspiration, resorting to keywords related to chemical knowledge and links between pandemic issues and the black population, so that narratives could be produced, following a timeline, that would spark students’ interest. The first case reports on the issue of street sanitation, according to WHO guidelines, addressing the content of oxidation-reduction and discussing how the black population was coping with the pandemic. The second case addresses the issue of using solutions to combat the coronavirus when using public transportation in a vulnerable neighborhood, covering the topics of solution concentration, dilution, acidity, and basicity, as well as structural racism, socioeconomic vulnerability, and the use of public transportation in the city of Salvador, Bahia. This case was flagged for implementation in EJA classes, based on a didactic sequence arranged in eight lessons, with application of the case, use of news and videos to discuss topics related to ethnic-racial relations (RER), expository-explanatory lessons for chemical conceptualization, and reapplication of the case for subsequent socialization of results.

It was then considered that the use of historical cases can be a powerful pedagogical tool that bridges the discussion of racial issues and the application of scientific concepts, but that each teacher can also adapt the work by making modifications and adjusting methodologies in order to foster possibilities for promoting anti-racist education.

In the article “Education for Ethnic-Racial Relations in the Teaching and Training of Chemistry Teachers: Implications of the Field of Study on Whiteness,” by Rhaysa Terezinha Gonzaga, and Fábio Peres Gonçalves, two pedagogical proposals were presented that link chemistry teaching with critical discussion about whiteness and structural racism. One of them was developed with a 3rd-year EJA class, integrating seven lessons from the subjects of Chemistry and Science, Culture, Technology, and Work, focused on reading and collective debate of the article by Lia V. Schucman (2012) entitled “Yes, we are all racists.”

By exploring the melanin molecule and its relationship with phenotype, aesthetic standards, and scientific racism, the chemistry content was worked on in an integrated and contextualized way, which allowed for the discussion of concepts such as the properties of carbon chains, functional groups, and polymer synthesis, associating them with different skin and hair types. The approach also included analysis of works of art such as *Arte Mimese*, by Peter de Brito (2005), contributing to a critical reading of society and reinforcing the interdisciplinarity between chemistry, art, and ethnic-racial issues.

The work highlighted chemistry as a tool for anti-racist education, promoting the recognition of racial privileges among white students and the appreciation of the experiences of black students. By focusing the debate on the agents of racism, the proposal raised awareness about whiteness, promoted student engagement, and demonstrated that EJA can be a powerful space for critical, civic, and transformative education.

In this category, there is a collection of proposals that link the teaching of chemistry with ERER, which demonstrates that chemistry content can be contextualized based on students' experiences, that is, addressing racial discussions, promoting critical reflection, and student leadership.

These articles use Freire's perspective, reinforcing that EJA should not be seen as a school replacement, but as a possibility for social transformation that starts from the reality of the students. Paulo Freire (1987) argues that teaching should provoke critical awareness in oppressed subjects, valuing their knowledge and histories. This idea dialogues directly with the practices reported in the category, which use chemical content to problematize structural racism and rescue historically marginalized knowledge, such as African-based scientific and technological knowledge (Pinheiro, 2021; Mascarenhas, 2021). Thus, it is clear that these practices are aligned with the reparative, equalizing, and qualifying functions of EJA as set out in the DCNs.

4 Conclusions

Thinking about Youth and Adult Education means thinking about the intellectual, social, and civic education of people with diverse experiences, also influenced by ethnic-racial relations. Consequently, the aim is for EJA students to be able to read and interpret the world. Therefore, it is necessary to raise concerns, promote pedagogical practices, and encourage research on the intersectional approach between EJA, ERER, and the teaching of chemistry, so that this modality perpetuates an education that is truly liberating and transformative.

There is a significant gap in academic production focused on the intersection between Youth and Adult Education (EJA), chemistry teaching, and Education for Ethnic-Racial Relations (ERER). The integrative review carried out in this study brought together only four works that address this intersection, which highlights the urgency of promoting research and pedagogical practices committed to building anti-racist education in this modality.

The studies show that, although EJA chemistry teachers recognize the importance of addressing ethnic-racial relations in teaching, there is a gap between theoretical knowledge about ERER and its effective application in pedagogical practice, and this problem is mainly linked to the lack of specific training. This reinforces the need for critical continuing education that not only informs about legislation but also encourages the development of curricula and the adoption of decolonial practices.

When ethnic-racial themes are integrated into chemistry content in a critical and contextualized way, there is an increase in student engagement, appreciation of students' experiences, and a strengthening of the emancipatory role of EJA. In other words, when education for ethnic-racial relations is presented as a teaching strategy, it has the potential to overcome historical difficulties in learning chemistry, as well as promoting the recognition of other epistemologies and knowledge that have historically been silenced.

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ⁱ **Rômulo Henrique Possatte Martins**, ORCID: <https://orcid.org/0009-0007-9114-9052>

Instituto Federal do Espírito Santo (IFES)

Mestrando em Química pelo Mestrado Profissional em Química em Rede Nacional, pelo Ifes, *campus* Vila Velha. Bacharel e licenciado em Química. Especialista em Ensino de Ciências da Natureza e em Educação de Jovens e Adultos.

Authorship contribution: writing – first draft.

Lattes: <http://lattes.cnpq.br/6207878483042236>

Email: romulo_possatte@hotmail.com

ⁱⁱ **Mari Inez Tavares**, ORCID: <https://orcid.org/0000-0001-8194-0544>

Universidade Federal do Espírito Santo (UFES)

Doutora em Educação (2020) pela UFES. Mestre em Ensino de Ciências – Modalidade Química (2009) pela USP. Professora adjunta nos cursos de licenciatura em Química e Pedagogia da UFES e professora colaboradora do Mestrado Profissional em Química em Rede Nacional, no Ifes Vila Velha.

Authorship contribution: writing – revision and editing.

Lattes: <http://lattes.cnpq.br/0786682219012611>

Email: mari.tavares@ufes.br

Responsible publisher: Genifer Andrade.

Ad hoc experts: Eduardo Jorge Lopes da Silva and
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