

# TEACHER TRAINING AND INTEGRATION BETWEEN ENVIRONMENTAL EDUCATION AND INCLUSIVE EDUCATION: A COMPARATIVE DIAGNOSIS BETWEEN THE MUNICIPAL NETWORKS OF ITAITINGA AND AQUIRAZ (CE) – BRAZIL

## FORMAÇÃO DE PROFESSORES E INTEGRAÇÃO ENTRE EDUCAÇÃO AMBIENTAL E EDUCAÇÃO INCLUSIVA: UM DIAGNÓSTICO COMPARATIVO ENTRE AS REDES MUNICIPAIS DE ITAITINGA E AQUIRAZ (CE) – BRASIL

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### Abstract

This study examines how teachers from the municipal school systems of Itaitinga and Aquiraz, Ceará, perceive the relationship between environmental education (EE) and inclusive education (IE) in their teaching practices. The topic is relevant due to the growing need for educational approaches that integrate sustainability and inclusion as essential pillars of contemporary education. The research adopted a qualitative approach with quantitative support and a comparative design. A structured questionnaire with objective questions was applied to 804 teachers from both municipalities. The data were analyzed and discussed based on legislation and recent academic literature. The results show that, although teachers acknowledge the relevance of integrating EE and IE, there are significant training gaps (particularly in EE) along with limited academic production and specific preparation in inclusive environmental education (IEE). Integration in pedagogical practice tends to rely on individual teacher initiatives, lacking institutional support and collective planning. It is concluded that, despite teachers' willingness to work collaboratively, actions remain fragmented and inconsistent, and local policies promoting IEE are not yet

### Resumo

O presente estudo analisou como professores das redes municipais de ensino de Itaitinga e Aquiraz, no Ceará, a formação e a integração entre educação ambiental (EA) e educação inclusiva (EI) em suas práticas pedagógicas. O tema é relevante devido à crescente necessidade de abordagens educacionais que integrem sustentabilidade e inclusão como pilares essenciais da educação contemporânea. A pesquisa adotou uma abordagem qualitativa com suporte quantitativo e um delineamento comparativo. Um questionário estruturado com questões objetivas foi aplicado a 804 professores de ambos os municípios. Os dados foram analisados e discutidos com base na legislação e na literatura acadêmica recente. Os resultados mostram que, embora os professores reconheçam a relevância da integração entre EA e EI, existem lacunas significativas de formação (particularmente em EA), além de produção acadêmica limitada e pouca preparação específica em educação ambiental inclusiva (EAI). A integração na prática pedagógica tende a se basear em iniciativas individuais dos professores, carecendo de apoio institucional e planejamento coletivo. Conclui-se que, apesar da disposição dos professores em trabalhar de



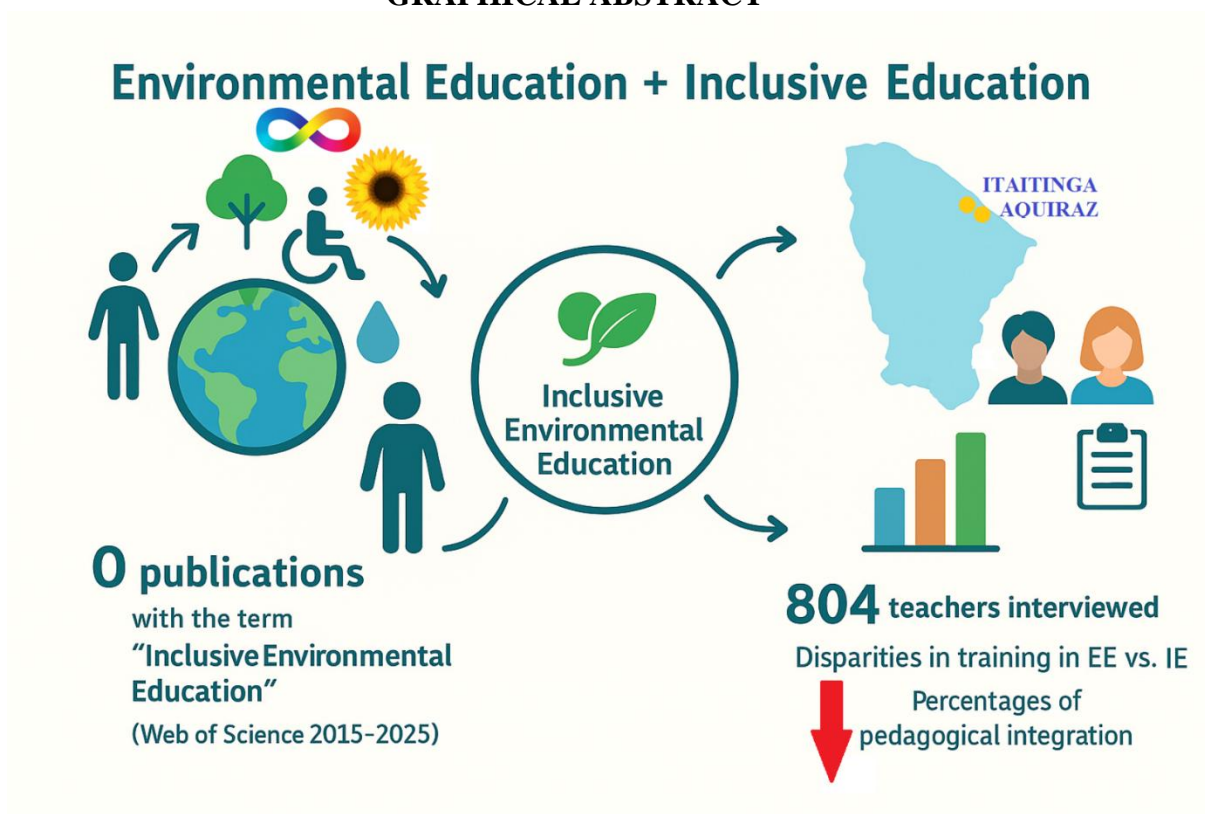
consolidated. The study emphasizes the need for continuous teacher education, revision of school political-pedagogical projects, and the institutionalization of IEE as a strategic path toward inclusive and sustainable education.

**Keywords:** Inclusion. Inclusive Environmental Education. Interdisciplinarity. Pedagogical Practices. Transversality.

*forma colaborativa, as ações permanecem fragmentadas e inconsistentes, e as políticas locais de promoção da EAI ainda não estão consolidadas. O estudo enfatiza a necessidade de formação continuada de professores, revisão dos projetos político-pedagógicos das escolas e institucionalização da EAI como um caminho estratégico para uma educação inclusiva e sustentável.*

**Palavras-chave:** Educação Ambiental Inclusiva. Inclusão. Interdisciplinaridade. Práticas Pedagógicas. Transversalidade.

## GRAPHICAL ABSTRACT



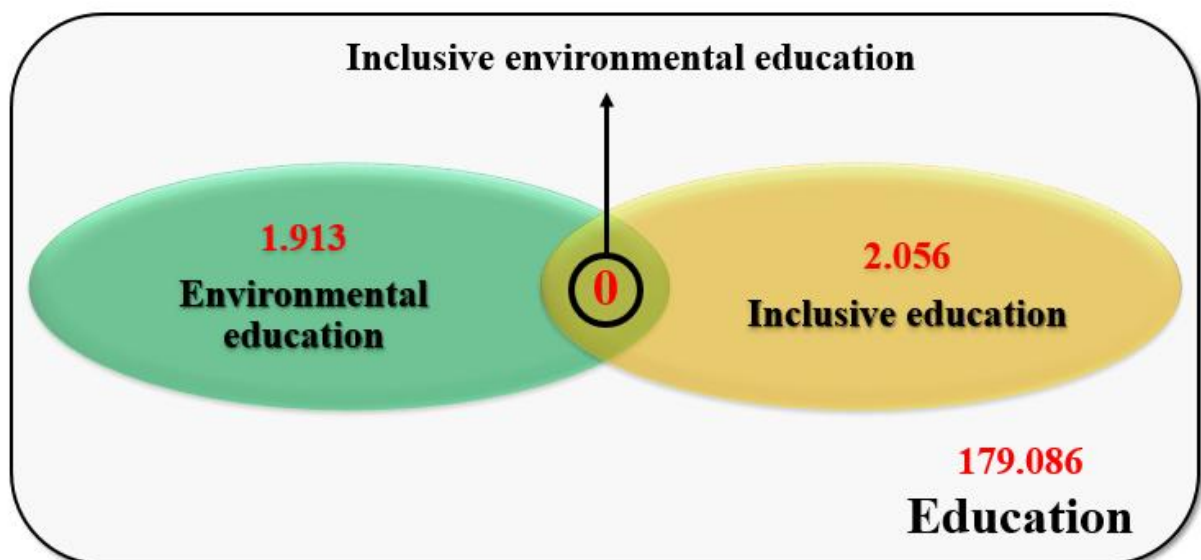
## 1 INTRODUCTION

The environmental and social transformations of the XXI century impose on schools the challenge of forming critical individuals committed to a just and sustainable society. Understanding climate change has become urgent at all levels (global, national, and local), making its inclusion in basic education essential. The increase in the planet's

average temperature, extreme events, and changes in climate patterns directly impact the most vulnerable populations, requiring joint and educational actions [1].

By conducting a bibliographic survey in the international database Web of Science, and considering exclusively scientific research articles from 2015-2025, and also using the terms "education," "environmental education," "inclusive education," and "inclusive environmental education" present only in the titles of the publications, a Venn diagram was generated (as illustrated in Figure 01), in addition to Figures 02 and 03 which present the refinement of the results according to the countries that produced the largest number of articles published in the aforementioned time interval.

Figure 1: Quantitative Venn diagram of scientific articles published with the terms "education", "environmental education", "inclusive education", and "inclusive environmental education" in the titles of the works. The data were obtained through the Web of Science platform, with refinement in the period 2015-2025

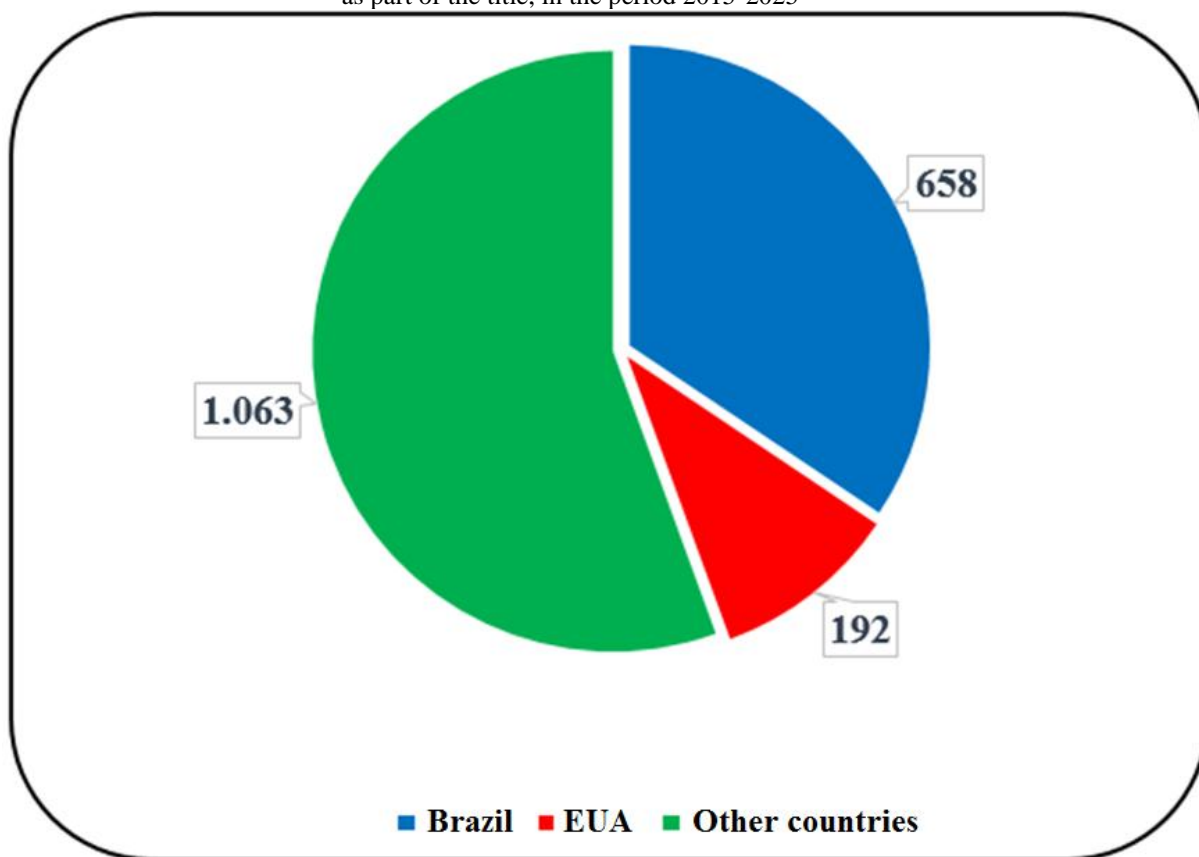


Source: Authors' own work (2025).

Using the broad term "education," 179.086 scientific research articles were found, demonstrating the relevance of education as a scientific field. Refining the search terms to "inclusive education" and "environmental education," the number of publications dropped to 2.056 and 1.913 articles, respectively. However, no publications were identified using the term "inclusive environmental education," revealing a significant gap in the international literature. This indicates that the articulation between the fields of environmental education (EE) and inclusive education (IE) has not yet been explored or recognized as a relevant axis of academic investigation. This void reveals not only a lack

of research on the topic but also the absence of a consolidated theoretical framework that integrates these two dimensions in a practical and critical way.

Figure 2: Quantitative graph of the countries with the highest number of published research articles obtained through the Web of Science database, simultaneously using the term "environmental education" as part of the title, in the period 2015-2025



Source: Authors' own work (2025).

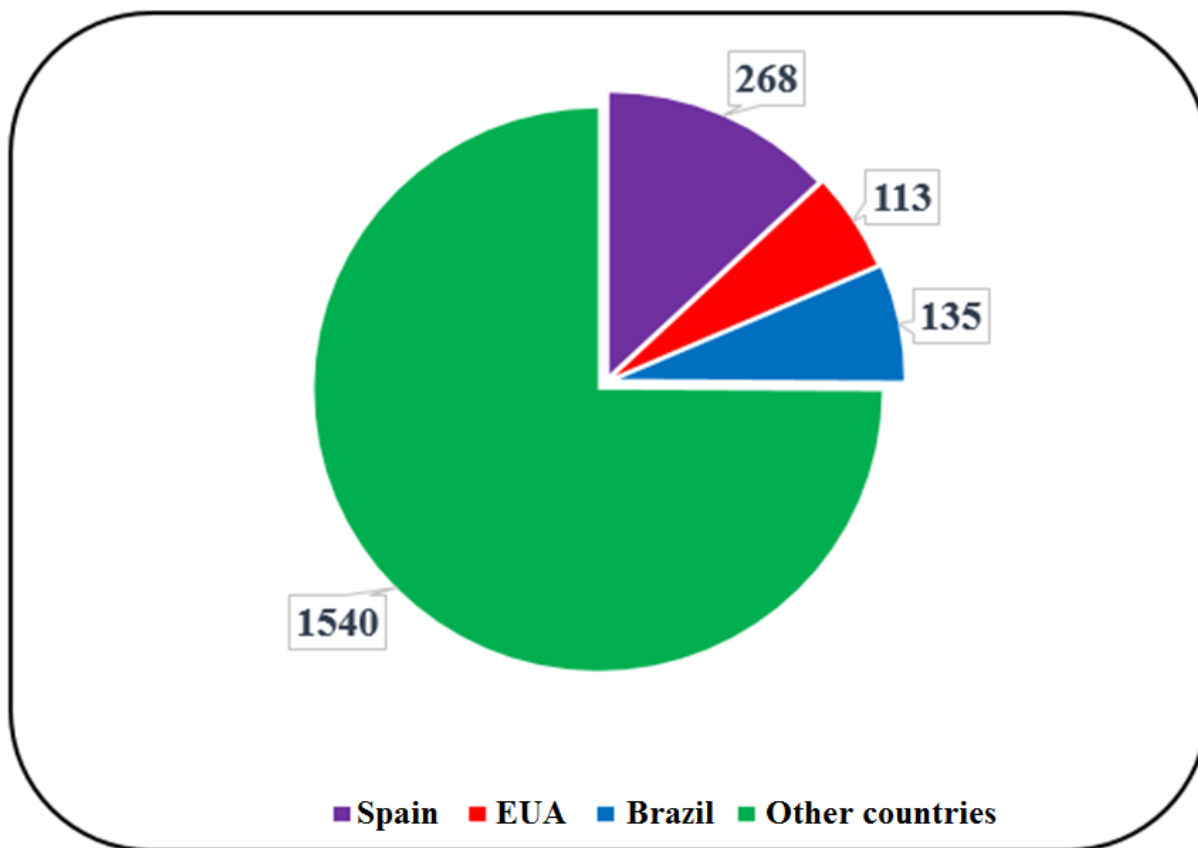
Based on Figure 2, it can be seen that Brazil stands out in scientific production in EE, with 658 publications (34.4% of the total), surpassing the United States and other countries combined. This Brazilian prominence can be attributed to the incorporation of EE as a guideline in public policies since the 1990s, as well as the significant role of civil society and social movements in promoting educational practices focused on sustainability.

In contrast, the relatively low number of publications in the US raises questions about the priorities of its educational agenda. The economic model based on consumption, intensive industrialization, and market logics contributes to the marginalization of environmental issues [2]. Despite global pressure for decarbonization, the country remains among the largest historical emitters of greenhouse gases (GHG), which is

reflected in educational practices that are not very critical of the developmental model and environmental degradation.

Furthermore, education in the USA tends to value technical skills and market innovation, to the detriment of critical socio-environmental approaches [3]. Internal political instability, marked by polarization and setbacks under denialist governments, also weakens public policies and initiatives aimed at environmental education, making the topic a target of ideological disputes. Subsequently, a search for the term "inclusive education" resulted in 2.056 scientific articles, with Spain having the highest number of publications (268), followed by Brazil (135) and the United States of America (113), as illustrated in Figure 3.

Figure 3: Quantitative graph of the countries with the highest number of published research articles obtained through the Web of Science database, simultaneously using the term "inclusive education" as part of the title, in the period 2015-2025



Source: Authors' own work (2025).

This result suggests a growing, yet still limited, interest in educational inclusion in academic and institutional contexts around the world. In Brazil, EE is recognized as a tool for developing values and knowledge focused on environmental preservation and socio-environmental justice [4]. Supported by Law n° 9.795/1999, EE should be integrated transversally at all levels of education and, in parallel, IE ensures access and participation for all students, especially those with disabilities, supported by the 1988 Federal Constitution, the National Policy on Special Education, the Brazilian Inclusion Law (BIL), and the National Common Curricular Base – NCCB [5-9].

In the state of Ceará, EE finds support in State Law n° 13.103/2001, which establishes the State Policy on Environmental Education, and is linked to other legislation that promotes sustainability, such as Law n° 16.290/2017, which deals with the Sustainable School Program, and the recent Law n° 18.520/2023, which establishes the State Policy for the Protection of Sea Turtles [10-12]. These laws strengthen the inclusion of environmental issues in public schools and reflect the institutional recognition of the

importance of ecological education for citizenship. However, the situation is not different from the rest of Brazil, because although the state has specific legislation and promotes actions aimed at educational inclusion, initiatives that integrate both approaches are still scarce.

Thus, the effective articulation between EE and IE is still in its early stages and in a very embryonic phase of application, especially in public basic education networks, and although both are recognized as fundamental dimensions for civic education, their paths often run parallel, without due dialogue or integration in pedagogical practices, compromising the access of students with disabilities to content and actions, resulting in exclusion [13,14].

At the municipal level, efforts are also unequal. Itaitinga and Aquiraz, for example, have laws and programs aimed at EE and IE, but lack diagnoses that assess teachers' perception of their training and integrated practice, and as in most Brazilian municipalities, there is no specific legislation dealing with so-called Inclusive Environmental Education (IEE). Despite this, both municipalities have developed relevant actions in both areas, albeit in a dissociated manner.

In the case of Itaitinga, in the field of EE, the municipality has Municipal Law n° 982/2025, which establishes the Municipal Environmental Education Policy of Itaitinga; in addition to carrying out regular educational activities during the Municipal Environment Week [15]. In the field of IE, noteworthy examples include Municipal Law n° 991/2025 (which establishes the Municipal Inclusive Education Policy and the “Inclusion in Motion” Program) aimed at including people with disabilities (PWDs) and people with Autism Spectrum Disorder (ASD) in sports activities; and Municipal Law n° 989/2025, which provides for the installation of adapted toys for children with disabilities in public and private leisure spaces, such as schools and squares. In addition to the municipal project “Hands that Speak and Welcome,” which aims to encourage traditional literacy and literacy in Libras (Brazilian Sign Language) for the deaf community, train municipal public servants to serve deaf people, and provide socialization and participation of the deaf community in various school and social activities [16].

The municipality of Aquiraz has actions focused on environmental education supported by Law n° 1.141/2006, which establishes the Municipal Environmental Management Plan including the promotion of environmental education in the school environment; by Municipal Law n° 948/2011, which establishes the Municipal

Environmental Education Policy; and by Municipal Law n° 898/2011, which allocates part of the resources of the Aquiraz Environmental Defense Fund – AEDEFUN to intra and extra-school environmental education actions [17-19]. Regarding early childhood education, Aquiraz develops regular teacher training actions, annually holds the Municipal Autism Awareness Week (including the exchange of experiences, support for families, and awareness-raising within the school community), in addition to specialized educational services (SES) in the municipal school system. However, as in Itaitinga, there is still no municipal legislation that integrates the approach to IEE in a structured and objective way.

Given this, this study comparatively analyzed the training and perception of teachers from Itaitinga and Aquiraz regarding the integration between EE and IE, through the application of a questionnaire, seeking to contribute to educational practices that promote an inclusive and sustainable school, aligned with Brazilian constitutional and legal principles [5-9].

## **2 METHODOLOGY**

This study adopted a qualitative approach with quantitative support, of a comparative nature, focused on the analysis of teachers' perceptions of training and pedagogical practice aimed at integrating EE and IE in the municipal school systems of Itaitinga and Aquiraz. Data collection was carried out using a structured questionnaire (see Supplementary Material 1), composed of objective questions, applied to teachers from these school systems. The instrument included questions about sociodemographic profile, initial and continuing training, pedagogical practices, school infrastructure, and self-perception of the ability to integrate EE and IE. The application took place online, using the Google Forms, with the support of school administrations and authorization from the municipal secretaries of education; it was carried out in May 2025, following ethical principles, with the voluntary participation of teachers and through the signing of the Free and Informed Consent Form (see Supplementary Material 2), ensuring anonymity, secrecy, and confidentiality of the information provided.

### 3 RESULTS AND DISCUSSION

The research included 804 teachers: 434 from the municipal network of Itaitinga and 370 from Aquiraz, representing 86.8% and 46.2% of the respective teaching staff (according to data provided by the Education Secretariats), which guarantees high representativeness and reliability to the comparative analyses.

Regarding professional status, there is a contrast between the municipalities: in Itaitinga, 72.8% of teachers are temporary and only 27.2% are permanent; while in Aquiraz, permanent teachers predominate (53%). The high proportion of temporary contracts in Itaitinga compromises pedagogical continuity, teacher training, and the construction of professional identity, although the municipality is in the process of a public competition to hire 270 teachers in 2025. The precariousness resulting from turnover compromises educational quality, hindering structured practices [20]. According to Oster, Martins and Sehnem [21], transience is one of the main factors that weaken the teaching career, demanding policies that value the permanent staff, regular competitions and investment in continuing education as ways to guarantee inclusive and sustainable practices.

The feminization of the teaching profession is present in both municipalities, with 77% in Itaitinga and 78% in Aquiraz, confirming the national trend of the teaching profession being composed mostly of women [22]. The predominant age range of active teachers is between 41 and 50 years old (with 38.7% of teachers in Itaitinga and 38.4% in Aquiraz), followed by the groups aged 31 to 40 and 51 to 60, indicating in both networks a profile of teaching staff with experience and expertise.

Regarding academic training, both networks present a similar profile. A degree in Pedagogy is predominant, with 79.3% of teachers in Itaitinga and 58.9% in Aquiraz. Most have at least one *lato sensu* specialization (80.8% in Itaitinga and 87.3% in Aquiraz), while *stricto sensu* specialization is still relatively uncommon: in Itaitinga, 5% hold master's degrees and 2.3% hold doctorates; in Aquiraz, 10.3% and 2.1%, respectively. These data reveal that, although *lato sensu* specialization training is widespread, *stricto sensu* postgraduate studies remain restricted to a minority. This reality aligns with Bitencourt [23] analysis, which pointed to the persistent perception of *stricto sensu* postgraduate studies focused on basic education as "onerous" and "non-essential,"

hampered by the absence of institutional support policies, flexible workloads, and teacher appreciation.

One relevant aspect observed refers to the material conditions of the schools: 8.3% of teachers in Itaitinga and 3.2% in Aquiraz reported a total absence of didactic technological resources in their units. Although the percentages are low, this lack compromises pedagogical innovation, inclusion, and the implementation of contextualized proposals in Environmental Education. According to Cabral and Costa [24], the lack of technological devices and specific training weakens the articulation between active pedagogical practices, digital inclusion, and socio-environmental projects.

Teacher training is fundamental for pedagogical practices aligned with the principles of EE and IE. The data analysis reveals disparities that directly impact the integration between these themes in municipal networks. In Itaitinga, training in EE during undergraduate studies proved to be limited: 54.1% of early childhood education teachers, 48.8% of Elementary School I teachers, and 43.1% of Elementary School II teachers stated that they had not taken any courses on the subject. On the other hand, training in IE was more significant: 92.6% of early childhood education teachers reported having taken courses on inclusion, a similar rate in Elementary School I (92.2%) and still relevant in Elementary School II (64.2%). This positive scenario is related to the advances promoted by the Brazilian Law for the Inclusion of People with Disabilities (BIL) and the NCCB, which consolidated inclusive guidelines in teacher training programs [8,9].

In Aquiraz, the data reflect a reality similar to that of Itaitinga: most teachers reported not having taken courses or training in EE during their undergraduate studies (46.3% in early childhood education, 51.6% in elementary school I, and 56.9% in elementary school II). In contrast, training in IE was more prevalent: 87.4% of early childhood education teachers, 71% of elementary school I, and 60.7% of elementary school II stated that they had received training in this area. These numbers show that EE is not yet consolidated as a mandatory component in undergraduate programs, hindering the critical and cross-cutting approach to environmental issues in pedagogical practice.

The analysis of continuing education reveals even more pronounced disparities between the themes. In Itaitinga, more than 80% of teachers, across all segments, participated in courses in Inclusive Education (IE) after graduation, while more than 60% never received training in Environmental Education (EE). The same trend is observed in

Aquiraz: more than 77% received continuing education in IE, but about 65% never participated in courses related to EE.

These data reveal a historical asymmetry between training policies in the two areas. While IE has been strengthened as a structuring guideline since the 2000s, with legal and regulatory support, EE, although provided for in Law n° 9.795/1999, still faces barriers to consolidating itself as a cross-cutting and mandatory policy, especially in teacher training.

Low levels of training in EE directly impact teachers' self-perception of their ability to perform. In both municipalities, about 50% of teachers stated that they address environmental issues at most once a year, usually at specific events such as science fairs or commemorative dates, which highlights the lack of curricular intentionality and the low institutionalization of EE in the networks. On the other hand, approximately 40% of early childhood education teachers reported working with EE more than four times a year, revealing disparities between the segments. Teacher training in EE needs to overcome reductionist and content-based approaches, integrating ecological knowledge with social issues and inclusive practices. The absence of this articulation constitutes a challenge to consolidating an IEE that is sensitive to the multiple dimensions of school and socio-environmental exclusion.

The consolidation of pedagogical practices that effectively articulate EE and IE depends directly on meaningful training, adequate institutional conditions, and teacher intentionality in lesson planning. The data obtained in the municipalities point to specific advances, but also important gaps that limit the implementation of an IEE in public schools.

In Itaitinga, 62.2% of teachers stated that they articulate the themes of EE and IE in their pedagogical practice, while in Aquiraz this number reached 78.6%; however, when these data are compared with the question about the frequency of EE actions developed by teachers in the networks, it is clear that a considerable part of the practices is concentrated in sporadic actions, as stated by the majority of the teachers themselves; clearly indicating that, consequently, these integrative actions of EE and IE are quite reduced, considering the very frequency with which EE is worked on (directly or transversally) in the classroom by teachers.

The data confirm that EE is still treated in a fragmented way, often disconnected from the reality of students and the principles of social justice and inclusion, as pointed

out by Pinho, Almeida and Lima [25]. Although most teachers claim to feel prepared to integrate EE and IE (more than 85% in Itaitinga and 88% in Aquiraz), this feeling is not reflected in regular and systematized practices. The absence of specific training on the integration between EE and IE is a persistent challenge: about 65% of teachers in Itaitinga and 67.6% in Aquiraz reported that their Education Departments never promoted this type of training. This gap highlights the lack of public policies that transversally articulate the environmental and inclusive dimensions, resulting in isolated and discontinuous practices.

#### 4 CONCLUSIONS

The study revealed advances and obstacles in teacher training and performance regarding the integration of EE and IE in the municipal networks of Itaitinga and Aquiraz. A gap in academic research on IEE was evident, not only in Brazil but worldwide. Although the importance of EE and IE is recognized, teacher training still has gaps, especially in the environmental field, which is often treated in a piecemeal fashion, without being consolidated as a structuring axis of the curriculum.

It was also observed that, although many teachers declare that they feel able to integrate EE and IE, effective practices are limited, reflecting the absence of specific training, institutional planning, and collective articulation in schools. The scarcity of intersectional approaches between these dimensions in initial and continuing education is one of the main challenges faced.

Even with relevant municipal legislation and programs, there are no specific guidelines aimed at IEE, which keeps initiatives fragmented, hindering structured and sustainable progress. Given this, it becomes urgent for public administrators, universities, and schools to engage in the formulation of policies and practices that promote the effective articulation between EE and IE. Investing in teacher training, revising political-pedagogical projects, updating the curriculum of undergraduate programs, and valuing collective work is essential to consolidating a democratic, inclusive school committed to sustainability.

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## AUTHOR CONTRIBUTIONS

**Marta Maria do Socorro Lima Barros Gonçalves:** investigation, methodology, validation, formal analysis, original draft writing – reviewing & editing.

**Janevane Silva de Castro:** investigation, methodology, validation, formal analysis, original draft writing – reviewing & editing.

**Emerson Mariano da Silva:** investigation, methodology, validation, formal analysis, original draft writing – reviewing & editing.

## DECLARATION OF COMPETING INTEREST

The authors declare no conflict of interest.

## POSITION STATEMENT ON LANGUAGE/TERMINOLOGY OF DISABILITY

The team of authors consists of researchers and educators in the health field with previous and current research interests in collaboration with the neurodiversity community. In this manuscript, we adopt the social model of disability as our theoretical framework.

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### **Authors' Contribution**

All authors contributed equally to the development of this article.

### **Data availability**

All datasets relevant to this study's findings are fully available within the article.

### **How to cite this article (APA)**

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