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THE CHALLENGES, LIMITS, AND POSSIBILITIES OF INCLUDING NEURODIVERGENT STUDENTS IN SCIENCE AND BIOLOGY EDUCATION IN THE MUNICIPALITY OF CAJAZEIRAS - PIAUÍ - BRAZIL

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ABSTRACT

Brazilian legislation ensures that all individuals must have access to the regular education system, including neurodivergent individuals. This study aims to analyze the inclusion of neurodivergent students in science and biology education in regular public state schools in the city of Cajazeiras, Piauí. This research is exploratory, applied, and qualitative in nature, aiming to understand the dynamics, behaviors, and interactions within the educational environment. This methodology was chosen to achieve direct immersion in the context studied, allowing for the capture of nuances that other forms of data collection might not reveal. The results will be presented in word clouds created through Tagul and subsequently critically analyzed based on the researcher's personal observation and perception. The inclusion of neuroatypical students in science and biology education in the city of Cajazeiras, Piauí, presents a complex scenario, full of challenges, but also vast possibilities. For this inclusion to be effective, it is essential that schools and educators be prepared to adapt methodologies, materials, and the learning environment itself. One of the main challenges lies in teacher training.

Keywords: Inclusion; Neurodivergent; Science and Biology Teaching; Piauí.

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INTRODUCTION

In the hope of meeting the needs of a group of individuals who have gained social visibility through their struggles for accessibility, education has been moving toward a reformulation of traditional teaching. Experiences of success and school challenges are based on the expectation of training professionals prepared for an egalitarian world, where social obstacles imposed by prejudice are overcome (Gadotti, 2000).

Based on this, the Brazilian National Common Curricular Base (BNCC) recognized that Basic Education aims to form the human being in an integral manner, implicitly opposing a purely cognitive view. This educational innovation adopts a pluralistic stance, encompassing various aspects of students' lives, recognizing them as individuals capable of learning through the embrace of their particularities and diversities for full and integral development (Brazil, 2015, p. 16).

In this context, the school must be a learning institution with a democratic and inclusive vision, having the duty to confront and act against discrimination and prejudice, embracing empathy for differences and diversities (Brazil, 2015, p. 16). In Brazil, the Brazilian Law for the Inclusion of Persons with Disabilities (Law No. 13.146), enacted in July 2015, provides for access to inclusive education capable of developing sensory, cognitive, social, and physical skills for neuroatypical students.

According to Ortega (2009), neurodiversity must be understood as human subjectivity and not as a disease. Based on this premise, individuals with Autism Spectrum Disorder (ASD), Attention Deficit Hyperactivity Disorder (ADHD), dyslexia, dyscalculia, among others, must be seen as unique subjects, as advocated by the BNCC.

Although research highlights the benefits of inclusion, this topic still presents challenges, especially regarding curricular adaptations suited to the specific needs of neuroatypical students, particularly in biology teaching practices. According to Carvalho (2018), inquiry-based teaching is a method capable of providing plausible means of learning, as it positions the student as a thinking and critical subject in the process, enabling argumentation, knowledge construction, and content assimilation.

The school is a social setting for interaction among individuals, with the duty to socialize knowledge and provide conditions, based on legislation, for the construction of comprehensive education for all.

Based on this, tests or activities applied to students requiring educational support should not be the same for all students in the classroom, often pre-made and available on question bank websites. Instead, they should consider educational specificities and be adapted to break the paradigm of traditional education, offering access possibilities to inquiry-based biology teaching.

According to Vilaronga, Mendes, and Zerbato (2016), traditional education is inefficient as it replaces a curriculum that should be accessible with a challenging learning process lacking support for

educational specificities. Therefore, when teachers encounter neurodivergent students in their classrooms, they must enrich their knowledge regarding the necessary curricular adaptations for the teaching-learning process. Seeking inclusive strategies, regardless of the condition, yields positive results in the educational process for all students.

The absence of this individualized attention from teachers toward neuroatypical students may be related to excessive workload, as well as classrooms filled with students with low academic performance and diverse/specific learning conditions (Vilaronga; Mendes; Zerbato, 2016). However, continued teacher training, an efficient organizational culture, and the presence of public policies recognizing inclusive education as a right are determining factors for neurodivergent students to be part of a fairer and more equitable society, enabling them to reach their highest potential.

According to Odom and Wong (2015), effective pedagogical practices result from activities involving interventions combined with collaborative classroom participation. Teachers must be attentive to goal setting, assertive communication, task adaptation, and most importantly: accepting the student as a capable individual, part of the learning process, requiring an Individualized Educational Plan (IEP) based on educational specificities. Ponte (2002) adds that even when teachers promote reflective pedagogical practices, the use of structured approaches yields satisfactory results that go beyond teaching, learning, and assessment for neurodivergent students.

Given the above, for neuroatypical students to actively participate in society with constitutionally guaranteed rights, a social and educational reform is necessary. One of the major challenges faced in Basic Education institutions is the lack of curricular adaptation and flexibility, as well as individualized pedagogical practices in biology teaching, as advocated by the National Policy on Special Education (PNEE) from the perspective of Inclusive Education (Brazil, 2001).

Therefore, biology teachers, in their pedagogical practices, must become mediators of the teaching-learning process, capable of including all students through feasible strategies and curricular adaptations, such as: developing inclusive pedagogical materials for biology teaching, referring students to learning support in Specialized Educational Services (AEE), adapting tests and content, providing individualized attention, among others.

This study presents a report on the challenges, limits, and possibilities in the inclusion of students with disabilities in science and biology education in schools in Cajazeiras – Piauí.

METHODOLOGY

The methodology employed for the development of this research was based on personal observation in classrooms in the city of Cajazeiras – Piauí. This qualitative approach was used to understand the dynamics, behaviors, and interactions within the educational environment. This

methodology was chosen to allow for direct immersion in the studied context, enabling the capture of nuances that other data collection methods might not reveal.

The results will be presented through word clouds created using **Tagul** (https://wordart.com/create), followed by a critical analysis derived from the researcher's personal observation and perception.

RESULTS AND DISCUSSION

The results of this research were obtained through personal observation. Figure 01 visually presents the most recurring themes. Patterns of frequency and central ideas that emerged from the observations are identified. Through the word cloud, qualitative data are presented in a clear visual representation, where the words that appear most frequently in the observation notes (and therefore are larger in the cloud) represent the most prominent concepts, objects, actions, or characteristics observed in the classroom.

Figure 01: Cloud of Observed Words in the Classroom. (in Portuguese)

Source: Authors, 2025.

Key terms include knowledge, practice, respect, teaching for all, diversity, difficulties, potentialities, prejudice, needs, resources, family, experience, adequate training, inclusive environment, attitudinal barriers, disabilities, disorder, materials, and challenges. Word size reflects term frequency.

It can be observed that the greatest challenge in promoting adapted biology teaching is related to numerous aspects, among which the lack of teacher training stands out—identified here as knowledge—both initial and continuing, combined with the obstacles faced in accessing the regular curriculum (Oliveira, 2020).

The need for practical activities was also identified. In biology, the teacher must be capable of conducting investigative teaching with students with ASD, using, for example, hyperfocus and encouraging a desire to learn more in a specific area of interest. This demonstrates that teaching practices can be inclusive, keeping students motivated and engaged in the learning process. In this way, with more individualized and specific support, autonomy can be achieved (Ribeiro; Cristovão, 2018). From this perspective, Oliveira et al. (2020) showed that during Specialized Educational Assistance (AEE), investigative science teaching fostered engagement and motivation during classes.

Given this context, it is necessary to have an education in which teachers are capable of including students with ASD, ADHD, dyslexia, dyscalculia, etc., in a teaching scenario with equity, for scientific literacy, with equal conditions for access and permanence in school through the Individualized Educational Plan (IEP) for the biology discipline, so that they can articulate knowledge and experiences in accordance with the curriculum for each grade level. From this perspective, Couto (2005) emphasizes that the educator is the key to initiating educational reform processes, in which the main tool is continuing education, making them prepared to work with the complexity of teaching.

According to Figueredo (2002), inclusive education requires a flexible school for all students, offering quality education that respects differences and diversity. This educational institution must expand its political stance, reclaiming the idea of equity in schools.

Regarding the social function of the school, Libâneo (2004, p. 47) states:

> "The main social and pedagogical function of the school is to ensure the development of cognitive, operational, social, and moral capacities through its commitment to curriculum dynamization, the development of thinking processes, participatory citizenship formation, and ethical education."

Based on this, we consider the importance of qualified biology teachers who can articulate essential knowledge and experiences for the construction of a systematized inquiry-based teaching that includes neuroatypical students in the school environment. Thus, the inclusion of these individuals in inquiry-based teaching allows students to become protagonists of their learning, becoming critical, reflective, and argumentative in the process of constructing their knowledge (Carvalho, 2013).

CONCLUSION

The inclusion of neuroatypical students in science and biology education in the city of Cajazeiras – Piauí presents a complex scenario, full of challenges but also vast possibilities. For this inclusion to be effective, it is essential that schools and educators be prepared to adapt methodologies, materials, and the learning environment itself. One of the main challenges lies in teacher training. Many professionals do not feel confident or qualified to deal with the diversity of needs of students with disabilities. The lack of

knowledge about different disabilities and appropriate pedagogical strategies can lead to a poorly inclusive education, where students with disabilities are marginalized from activities. Another critical point is accessibility. This goes beyond the physical structure of the school (ramps, adapted restrooms) and includes the accessibility of educational materials. Braille texts, audio materials, videos with subtitles and sign language (Libras), and adapted software are essential to ensure that all students have access to content. The lack of financial resources to acquire or adapt these materials is a significant barrier, especially in public schools. Curricular adaptation is an ongoing challenge. It is necessary to plan lessons that are challenging for all students, without excessively simplifying content for students with disabilities, but also without ignoring their difficulties. This requires an individualized approach for each student, understanding their potential and limitations.

Additionally, resistance from some members of the school community, including parents of students without disabilities, can hinder the inclusion process. Prejudice and misinformation remain barriers to be overcome. The limits of inclusion are often tied to the challenges themselves. The lack of adequate human and material resources is a significant constraint. Without support professionals (sign language interpreters, caregivers, mediators), full inclusion becomes unfeasible for some students.

The rigidity of the educational system, which often prioritizes standardization over individualization, also imposes limits. The pressure for results in standardized assessments can lead to neglect of the specific needs of students with disabilities. In cases of severe and multiple disabilities, the limit may be imposed by the need for much more specialized support, which regular schools are not always equipped to fully provide. In such cases, collaboration with health and social assistance services is crucial. Despite the challenges and limits, the possibilities for inclusion in science and biology education are vast and enriching for all involved. Inclusion promotes the development of socio-emotional skills in all students. Living with diversity teaches empathy, respect, and collaboration. Students without disabilities learn to value differences and support their peers, while students with disabilities develop autonomy and self-esteem. The need to adapt teaching stimulates teachers' creativity and pedagogical innovation. In seeking new ways to present content, educators may discover methodologies that benefit not only students with disabilities but the entire class. The use of visual, tactile, and experimental resources, for example, can make science and biology classes more engaging and accessible for everyone. Inclusion paves the way for personalized teaching, recognizing that each student learns at their own pace and in their own way. This leads to more flexible and adaptable teaching that values individuality. For neuroatypical students, inclusion in science and biology education provides access to scientific knowledge, which is fundamental for understanding the world and exercising citizenship. They can develop critical thinking, participate in experiments, and explore the fascinating universe of life and nature. The inclusion of students with disabilities in science and biology education is not merely a matter

of complying with the law, but of recognizing everyone's right to education and enriching the learning environment through diversity.

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