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ORIGINAL

Dyslexia and Learning Health: Analysis of Teacher Profiles through Latent Classes in Three Provinces of Ecuador

Dislexia y salud del aprendizaje: análisis de perfiles docentes mediante clases latentes en tres provincias de Ecuador

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ABSTRACT

Introduction: dyslexia is a neurodevelopmental condition that affects cognitive health and compromises students' emotional well-being and learning trajectories. Persistent misconceptions among teachers regarding its causes, diagnosis and intervention continue to obstruct inclusive education and delay early responses.
Method: this was a non-experimental, quantitative and descriptive study. A validated structured questionnaire was applied to 3,665 teachers from Azuay, Cañar and Morona Santiago in Ecuador. The instrument assessed sociodemographic data and teachers' knowledge about dyslexia. Descriptive statistics and latent class analysis were conducted.
Results: the mean knowledge score was 76,57 out of 100. Six latent knowledge profiles were identified, ranging from conceptual clarity to confusion and myths. Differences among groups revealed uneven understanding of dyslexia and limited scientific training on the subject.
Conclusions: teachers' knowledge of dyslexia remains partial and heterogeneous. Work experience does not ensure conceptual accuracy. These findings highlight the need for teacher training programs that strengthen cognitive health, support inclusive pedagogical practices and guide public policy in educational systems.

Keywords: Dyslexia; Teacher Training; Learning Health; Inclusive Education; Educational Diagnosis; Learning Difficulties.

RESUMEN

Introducción: la dislexia es una condición del neurodesarrollo que afecta la salud cognitiva y compromete el bienestar emocional y las trayectorias de aprendizaje de los estudiantes. Los conceptos erróneos persistentes entre los docentes sobre sus causas, diagnóstico e intervención continúan obstruyendo la educación inclusiva y retrasando las respuestas tempranas.
Método: estudio no experimental, cuantitativo y descriptivo. Se aplicó un cuestionario estructurado validado a 3 665 docentes de Azuay, Cañar y Morona Santiago en Ecuador. El instrumento evaluó los datos sociodemográficos y el conocimiento de los profesores sobre la dislexia. Se realizó estadística descriptiva y análisis de clases latentes.
Resultados: la puntuación media de conocimiento fue de 76,57 sobre 100. Se identificaron seis perfiles de conocimiento latentes, que van desde la claridad conceptual hasta la confusión y los mitos. Las diferencias entre los grupos revelaron una comprensión desigual de la dislexia y una formación científica limitada sobre el tema.
Conclusiones: el conocimiento de los profesores sobre la dislexia sigue siendo parcial y heterogéneo. La

experiencia laboral no garantiza la precisión conceptual. Estos hallazgos resaltan la necesidad de programas de formación docente que fortalezcan la salud cognitiva, apoyen prácticas pedagógicas inclusivas y orienten las políticas públicas en los sistemas educativos.

Palabras clave: Dislexia; Formación del Profesorado; Salud del Aprendizaje; Educación Inclusiva; Diagnóstico Educativo; Dificultades de Aprendizaje.

INTRODUCTION

Dyslexia, more than a reading difficulty, constitutes a neurodevelopmental condition that compromises both learning and students' cognitive well-being. Recognised as a specific learning disorder, it interferes with the acquisition of accurate and fluent reading and often coexists with emotional stress due to academic exclusion.[1,2] This issue, while pedagogical, intersects directly with public health and educational equity.[1,3,4] From a policy perspective, the early detection and appropriate response to dyslexia should be regarded as a preventive measure to safeguard the emotional stability and educational trajectory of schoolchildren.

Despite international recognition, misconceptions about dyslexia persist in many classrooms, where it is wrongly attributed to vision problems, low motivation, or laziness.[5] Such beliefs—unsupported by scientific evidence—obstruct inclusive practices and delay intervention.[6] Limited training in neurodiversity during teacher education exacerbates the problem, as insufficient knowledge leads to inappropriate strategies, reinforces stigma, and undermines school well-being.[7] Teacher preparation is therefore essential to ensure real educational inclusion by creating supportive school environments that promote mental health and learning equity.

In this context, limited teacher training in dyslexia poses a risk to effective inclusion and indirectly compromises the overall quality of the educational system. Ecuador reflects the same global challenge: although regulations promote inclusion, teachers face difficulties in identifying signs of dyslexia and applying relevant strategies. These gaps are particularly evident in rural or hard-to-reach areas, where training opportunities are scarce and myths persist without scientific verification.[8,9,10] The lack of systematic studies in Ecuador further prevents a comprehensive understanding of how dyslexia is perceived and addressed in practice.[11]

Misconceptions about dyslexia are not harmless. When a teacher assumes that this condition can be overcome by effort alone, or associates it with intellectual limitations, damaging practices are imposed. Instead of providing structured support, students are told to "try harder," which contributes to long-term exclusion.[12] The absence of specialised training and limited dissemination of up-to-date research leave dyslexia as an ambiguous field in educational policy. This situation compromises the academic development of affected students and, more broadly, undermines the promise of inclusive education.

METHOD

Research Focus

This study adopted a quantitative approach to describe response patterns in a representative sample. Data were collected through standardised instruments and processed numerically to identify trends and variations.[13] The analysis focused on characterising teachers' knowledge of dyslexia in relation to sociodemographic and academic variables. Descriptive statistics, including frequencies, percentages, and distributions, were applied to organise the data into comparable categories and draw conclusions.[14]

Type of research

This research followed a descriptive design, aimed at characterising teachers' knowledge of dyslexia and identifying prevalent misconceptions. The objective was to determine the level of understanding and the presence of misconceptions among Ecuadorian teachers, without influencing their responses or altering prior perceptions.[15]

Methodological design

The study adopted a non-experimental, cross-sectional design, limited to observing teachers' conceptions of dyslexia at a specific point in time.[16]

Population and sample

The study included the entire population of 3,665 teachers from different educational levels in the provinces of Azuay, Cañar, and Morona Santiago, Ecuador. The selection was based on institutional accessibility, availability in the ministerial data system, and proportional representation by province. This comprehensive coverage ensured heterogeneity in terms of age, gender, level of training, type of institution, and work experience,

thereby enriching the descriptive analyses.[17]

Data collection techniques and instruments

The study used a survey, due to its effectiveness in collecting information from large populations within a reasonable timeframe and with a low margin of error. The instrument was a structured questionnaire of 25 items, divided into two sections. The first part collected demographic and professional information (age, gender, province, educational level, teaching area, and years of experience). The second part consisted of 20 multiple-choice items related to teachers' knowledge of dyslexia (figure 1).

Information demographic		
N.	**Item**	**Answer**
1	Age	
2	Sex	Feminine / Masculine / Prefers not to say it
3	Province	Azuay / Cañar / Morona Santiago
4	Ethnic group	Mestizo, Indigenous, Afro-Ecuadorian, Other
5	Type of institution in which you work	Fiscal / Fiscomisional / Municipal / Private
6	Vocational Training Area	Social Sciences, Education, Psychology, others.
7	Educational level at which you are currently working	Initial, Basic, Baccalaureate, Superior
8	Academic level achieved	Third Level, Master's, Doctor
9	Years of teaching experience	

Knowledge about dyslexia							
N.	**Item**	Options					
		1	2	3	4	5	
1	Dyslexia is caused by visual problems.						
2	People with dyslexia have a low IQ.						
3	Dyslexia can be detected in the first years of schooling.						
4	All kids with dyslexia write letters backwards.						
5	Dyslexia can only be overcome with constant practice in reading.						
6	Dyslexia is a permanent condition.						
7	People with dyslexia can progress if they receive specialized support.						
8	Dyslexia only affects reading.						
9	An inclusive school environment supports learning for students with dyslexia.						
10	Dyslexia can be confused with a lack of motivation.						
11	All students with dyslexia require special education.						
12	It is important to adapt teaching strategies according to the needs of students with dyslexia.						
13	Dyslexia may have a hereditary component.						
14	The teacher's level of knowledge has a direct impact on the attention of students with dyslexia.						
15	Students with dyslexia have difficulties only in oral reading.						
16	Dyslexia affects word recognition and reading comprehension.						
17	Detecting dyslexia early improves a student's academic performance.						
18	Dyslexia can coexist with other learning disorders.						
19	Students with dyslexia should be evaluated with differentiated instruments.						
20	Inclusive pedagogical strategies are beneficial for all students.						

Figure 1. Multiple choice questionnaire on dyslexia applied to teachers

The questionnaire was validated through expert judgement by three specialists in education and psychology, who assessed the clarity, coherence, and relevance of the items. A pilot test was subsequently conducted with a small group of teachers (n = 3,665), leading to minor adjustments in wording. Reliability was confirmed using Cronbach's alpha (α = 0,890), which indicated adequate internal consistency for the instrument.[18]

Data processing and analysis

Once the survey was administered, the data were coded and processed using SPSS version 26. Qualitative variables were transformed into numerical variables, and frequency matrices, percentage distributions, and

measures of central tendency were generated. Descriptive analysis was applied to identify response patterns, clusters of misconceptions, and distribution of knowledge according to sociodemographic variables. In addition, cross-analyses were conducted to observe correlations between educational level and type of response, without attempting to establish causal relationships.[19]

Ethical Considerations

The research followed international and institutional ethical standards for educational studies. Participation was voluntary and based on informed consent. Anonymity and confidentiality of data were guaranteed at all stages of the process. The study was reviewed and approved by the Ethics Committee of the Universidad Nacional de Educación (UNAE).

RESULTS

After administering the questionnaire to the 3 665 participating teachers, the data provided a broad and nuanced picture of their level of knowledge about dyslexia. Descriptive statistics allowed for an accurate characterisation of the behaviour of the responses. The mean total score was 76,57, with a median of 77, showing a general trend towards correct responses in line with scientific evidence. However, the standard deviation (12,28) and interquartile range (14) reflected considerable dispersion, suggesting that while some teachers demonstrated solid knowledge, significant gaps persisted among other groups. The asymmetry coefficient (-0,64) indicated a slight leftward skew, while the kurtosis (2,27) pointed to a relatively flat distribution, where responses were dispersed with less concentration around the mean (figure 2).

Statistic	Value
N	3665
Media	76.57
Median	77
Deviation standard	12.28
Interquartile Rank (IQR)	14
Minimal	20
Maximum	120
Asymmetry	-0.64
Curtosis	2.27

Figure 2. Descriptive statistics of the total score obtained in the dyslexia knowledge questionnaire (DKQ)

This behaviour was not uniform across all items. Some generated consensus, especially those referring to the permanent nature of dyslexia or the benefits of early detection. In contrast, other statements generated dissonance. It is particularly worrying that a considerable proportion of responses continued to mistakenly link dyslexia with visual problems or intellectual limitations. Although these beliefs were less frequent, their presence reveals the persistence of certain myths rooted in the pedagogical imagination.

To gain a deeper understanding of the interpretative patterns of the responses, a Latent Class Analysis (LCA) was applied. This strategy made it possible to identify six distinct profiles of teachers, according to their consistency, level of knowledge and conceptual alignment. The six-class model was the one that best fit the BIC index, allowing for a more precise segmentation of the evaluated group.

Class 1 grouped teachers with consistent, accurate, and well-founded responses, which denoted a comprehensive understanding of the disorder.

Class 2 included those who recognised basic symptoms but showed significant gaps in their knowledge of the neurobiological origin and diagnosis.

Class 3 was composed of teachers who were correct in practical aspects of the classroom but failed in technical definitions, revealing a disconnect between theory and practice.

In Class 4, responses were polarised: general items were answered correctly, but more complex items were systematically answered incorrectly.

Class 5 reflected an intermediate and unstable profile, with fluctuating responses that did not follow a defined pattern, which may be associated with a phase of conceptual transition.

Class 6 comprised the smallest and most vulnerable group in terms of knowledge, with numerous errors in almost all items, evidencing the persistence of deeply rooted misconceptions.

To visualise the distribution of these profiles across the items, a heat map was generated (figure 3). This graph allowed us to observe, using a colour scale, the differences in average responses by class and item. While Class 1 exhibited a homogeneous and high tone (indicating mastery of the content), Classes 5 and 6 showed a more dispersed and tenuous gradation, associated with conceptual weakness or contradiction.

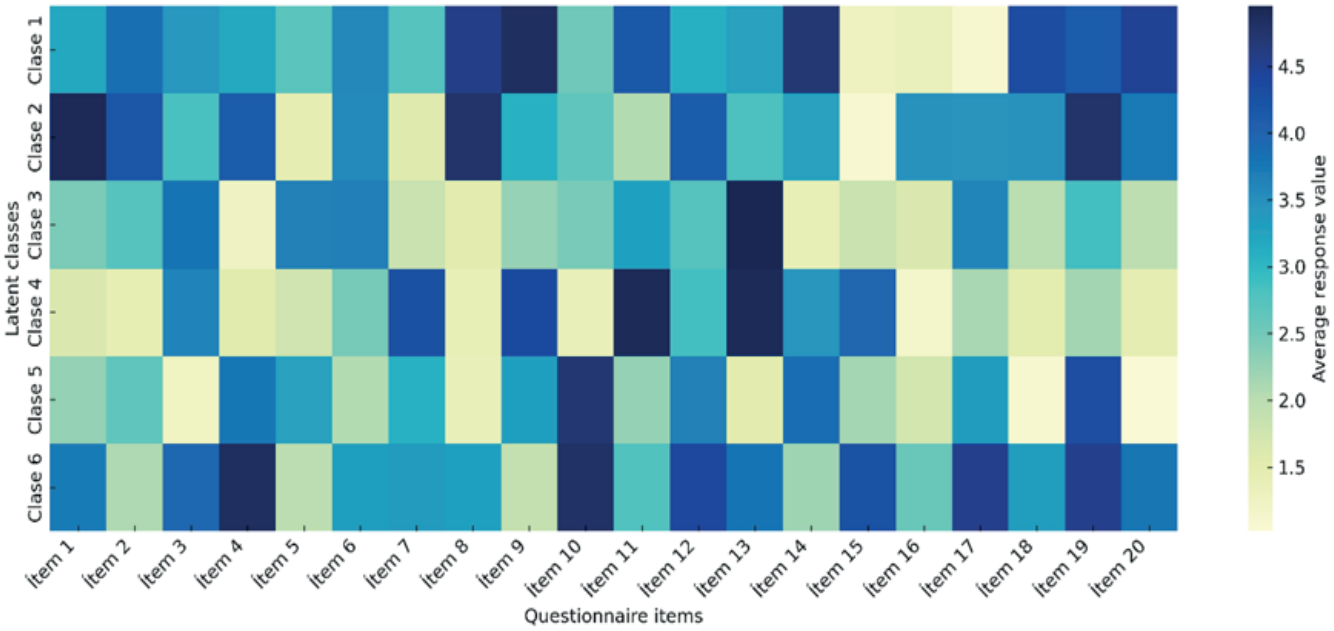

Figure 3. Heatmap: response patterns by latent class and item

Overall, the results reflect a mixed picture in education. Although a significant proportion of Ecuadorian teachers have moved towards a more scientific and empathetic understanding of dyslexia, misconceptions persist that could interfere with the inclusive teaching process. This finding should not be cause for alarm, but rather an urgent invitation to strengthen continuing education pathways, from an updated, sensitive and committed perspective on neurological diversity. All this information was processed using R software, employing libraries specialised in data analysis and graphical representation (poLCA, ggplot2, dplyr), which ensured accurate and reliable systematisation.

DISCUSSION

Summary of Findings

The results showed clear differences in the way teachers understand dyslexia. Some demonstrated a solid understanding, while others repeated misconceptions, fully justifying the need to conduct this study. The profile of the teachers was varied, including participants from all educational levels, ages, and types of institutions. This diversity allowed a richer interpretation of the findings. Importantly, not all teachers with more years of experience responded more accurately; in some cases, those with longer service still held misconceptions. This suggests that experience alone does not ensure conceptual accuracy, and that continuing education plays a decisive role.

Summary of Findings

The average score of 76,57 points indicated an acceptable level of knowledge, but the standard deviation revealed considerable dispersion. This variability reflected training gaps and possible external influences. Sensitive issues were also identified: several teachers continued to believe that dyslexia has visual causes or can be overcome with effort. These ideas contradict scientific evidence and reveal the persistence of stigmas, similar to findings in Spain, Peru, and Portugal.[20,21,22,23]

Latent Class Analysis allowed the segmentation of six distinct knowledge profiles. Class 1 concentrated the most accurate and consistent responses, while Classes 5 and 6 showed conceptual insecurity and contradictions. This classification facilitated pedagogical interpretation of the results. The heat map visually confirmed these patterns: classes with greater knowledge showed uniform colours, while those with lower performance reflected diffuse and inconsistent tones.[24,25]

Comparison with Literature

Comparing these findings with previous research confirms a structural problem: many teachers are familiar with the term dyslexia but do not know how to respond in practice. This disconnect between theory and practice negatively affects inclusion and the quality of educational support.[8] The persistence of misconceptions does not necessarily stem from negligence but from lack of scientific preparation, reinforcing the need for continuous training programmes.

Instrument Reliability and Training Implications

In addition, the instrument used demonstrated good consistency, with high reliability (α = 0,890). This allowed trust in the results obtained. The design of the items also helped to identify nuances: beyond right or wrong answers, the degree of certainty revealed the strength or ambiguity of teachers' conceptions. This finding underscores that information about dyslexia is not disseminated uniformly. Access to training and institutional culture play an important role and must be considered when designing teacher development programmes.[3]

The study also confirmed that teachers value inclusion and recognise their role in supporting students with dyslexia. However, they do not always know how to implement strategies effectively. This gap between intention and action is recurrent in various contexts.[8] Similarly, weaknesses were observed in initial training, suggesting that universities are not sufficiently preparing future teachers to address neurological diversity. This indicates a pending debt in higher education institutions, which must strengthen curricular content and link theory with pedagogical practice.

Hermeneutic Perspective

From a hermeneutic perspective, this study also made it possible to interpret teachers' thinking. It revealed not only what they knew, but also what they believed and feared. Some responses appeared coherent but concealed doubts, showing that knowledge is a situated construction conditioned by experience, environment, and social discourse.[26]

Limitations and Future Research

This study has certain limitations that must be acknowledged. First, the use of a non-probabilistic sampling strategy limits the generalisability of the results to other provinces in Ecuador. Second, the cross-sectional design captures teachers' knowledge at a single point in time, preventing the establishment of causal inferences. Third, the reliance on self-reported data may have introduced social desirability bias, as participants could have provided answers they perceived as correct rather than reflecting their actual beliefs.

Future research should address these limitations by applying longitudinal and mixed-method designs, incorporating qualitative approaches to better capture teachers' reasoning and classroom practices. Expanding the analysis to additional provinces and comparing results across different educational systems would also provide a more comprehensive understanding of how dyslexia is conceptualised and addressed in diverse contexts.

CONCLUSION

This study assessed teachers' knowledge of dyslexia and revealed that it is partial, fragmented, and often erroneous. Professional experience alone does not ensure conceptual accuracy, which compromises teaching practice, threatens educational equity, and risks students' cognitive well-being. The findings highlight the urgent need to implement scientific, accessible, and continuous training programmes, tailored to the diverse knowledge profiles identified. Such strategies can correct misconceptions, strengthen educational inclusion, and improve institutional responsiveness. The implementation of these targeted training strategies would directly strengthen students' cognitive health, close structural gaps in educational equity, and enhance the overall quality and inclusivity of school environments.

REFERENCES

1. Alqahtani SS. Predictive validity of early and mid-year literacy assessments for end-of-year word reading fluency. PLoS ONE. 2025;20(6):e0327242.

2. Malhi H, Fitzpatrick N, Lewis D, Williams V, Woodham D, Fletcher J. Comparison of traditional aseptic technique versus standard aseptic non-touch technique (ANTT) in training patients to manage home parenteral support – A single centre cohort study. Clin Nutr ESPEN. 2025;68:134–9.

3. Knight C. Dyslexia: Identity, labelling and its place in inclusive education. Br J Spec Educ. 2025;52(2):251–7.

4. George TC, Hudson L, Brown SD, Coleman V. Reimagining Physician Assistant Education: Championing... : The Journal of Physician Assistant Education. J Physician Assist Educ. 2025;36(2):204–8.

5. Goddings AL, Johnston R, Wortley E, Patel R, Boyd H, Newlands F, et al. Characterisation and Management of Children and Young People Referred to a Paediatric Tertiary Post-COVID Service. J Adolesc Health. 2025;76(6):1025–33.

6. Iliska D, Gudoniene D. Sustainable Technology-Enhanced Learning for Learners with Dyslexia. Sustainability. 2025;17(10):4513.

7. Tenemaza M, Navarrete R, Jaramillo E, Rodriguez A. Specific Dyslexia Exploratory Test (TEDE): Two Tasks Using Augmented Reality. In: Cham: Springer; 2018. p. 925–33. Available from: https://link.springer.com/chapter/10.1007/978-3-319-94947-5_91

8. Larco A, Carrillo J, Chicaiza N, Yanez C, Luján-Mora S. Moving beyond Limitations: Designing the Helpdys App for Children with Dyslexia in Rural Areas. Sustainability. 2021;13(13):7081.

9. Pınar Y, Bayat N, Yüksel B, Özkara Y. Reading and White Matter Development: A Systematic Review of Neuroplastic Changes in Literacy. Children. 2025;12(6):710.

10. León TJL, Cadena KVG, Arroyo PAA. EFL Pre-service Teachers' Understanding about Dyslexia. Data Metadata. 2024;3:219.

11. Hoferichter F, Raufelder D. Mind, brain and education—Neuromechanisms during child development. Br J Educ Psychol. 2025;95(2):223–33.

12. Lijbers KM, van Viersen S, van Tilborg AJ, Bakx A. Cognitive Profiles of Gifted Discrepant Readers in Primary Education. Gift Child Q. 2025;69(3):285–97.

13. Bruhn K. A Handbook of Media and Communication Research: Qualitative and Quantitative Methodologies. Taylor & Francis Group; 2021.

14. Pánek J. EduChange Methodology. Univerzita Palackého v Olomouci; 2022.

15. Hernández R, Mendoza C. Metodología de la investigación: las rutas cuantitativa, cualitativa y mixta. McGraw Hill. México; 2018.

16. Müller F. Design Ethnography Epistemology and Methodology. Springer; 2021.

17. Hinostroza EMF, Mendoza DJ, Cejas MN, Trujillo EPP. Linear regression model to predict the use of artificial intelligence in experimental science students. Int Electron J Math Educ. 2025;20(1):em0807.

18. Mendoza D, Barreiro LMA, Chica TKM, Medranda EMA, Chávez SAR. Resilience in vulnerable university groups: An analysis of social work intervention strategies from the perspective of social inclusion. Educ Sci J. 2024;26(1):82–102.

19. Cejas MF, Liccioni EJ, Murillo Naranjo ME, Mendoza Velazco DJ. Business Management: Communication as a Key Competence. Икономически Изследвания. 2024;(3):166–80.

20. Thompson AM, Wood C, Thompson IK, Carroll JM. Seeing, Being Seen and Being Able to See Dyslexia in English Schools: Parent and Teacher Perspectives. Dyslexia. 2025;31(2):e70003.

21. Ronksley-Pavia M, Nguyen L, Wheeley E, Rose J, Neumann MM, Bigum C, et al. A scoping literature review of generative artificial intelligence for supporting neurodivergent school students. Comput Educ Artif Intell. 2025;9:100437.

22. Celli RM, del Valle Soria S. Inclusive education and curriculum adaptations: strategies for school equity. Neurodivergences. 2024; 3:124.

23. Mokmin NAM, Rassy RP, Yie DL. Evaluating augmented reality in physical education for dyslexic students from the perspectives of teachers and students. Sci Rep. 2025;15(1):7682.

24. O'Dwyer S, Lavington G, Miller J, Elfes C, Calogeras A, El-Bakri F. Screening doctors in training for dyslexia: the benefits of an inclusive screening approach. Postgrad Med J. 2025;101(1194):360–5.

25. Germán Flores L. Specific Learning Disorders: Neurobiological Foundations, Differential Diagnosis, and

Educational Implications. Neurodivergences. 2025;4:268.

26. Lee T, Leung M, van Boxtel JJA, Boon MY. The Effects of Refractive Imbalance on Binocular Vision Status, Reading Performance, and Vision-Related Reading Difficulty Symptoms in Expert Readers. Invest Ophthalmol Vis Sci. 2025;66(9):15.

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CONFLICT OF INTEREST

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