



Brazilian teachers' knowledge of dyslexia, language, and literacy instruction

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Abstract

This exploratory study assessed Brazilian teachers' knowledge of dyslexia, linguistics, and reading instruction methods as well as socioeconomic predictors of their performance. Teachers ($N = 214$) completed a sociodemographic questionnaire and three instruments assessing knowledge of dyslexia, phonology, and reading instruction. Participants worked in public schools, were predominantly female (98.59%), with a mean age of 41.8 years ($SD = 7.98$), over ten years of teaching experience, and degrees primarily in Pedagogy. Mean accuracy on the dyslexia items was 67.09%, although 78.5% of participants incorrectly associated reading disability with intelligence. Phonological knowledge was limited (40.3%), particularly in phoneme identification. School location and teaching role predicted teachers' linguistic knowledge, while additional training emerged as the strongest predictor of dyslexia knowledge. In open-ended questions, the whole-word method was most frequently reported, whereas phonics-based instruction was rarely mentioned and often poorly conceptualized. Overall, Brazilian teachers demonstrated limited knowledge across key literacy domains, underscoring the need for targeted teacher education and literacy policies grounded in the science of reading.

Keywords Dyslexia · Teacher knowledge · Phonological awareness · Reading instruction · Literacy education

Introduction

Despite substantial reductions in illiteracy over recent decades, significant educational disparities persist across regions and demographic groups in Brazil. In 2022, the national illiteracy rate was 7%, representing approximately 11.4 million people aged 15 years or older. However, rates varied considerably by municipality size and

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racial background, ranging from 3.2% in large municipalities to 13.6% in small municipalities and from 4.3% among White individuals to 16.1% among Indigenous populations (IBGE, 2022). These disparities suggest that increased access to education has not always translated into equitable literacy outcomes. Consequently, challenges remain in ensuring that all students receive effective literacy instruction and opportunities to develop the reading and writing skills necessary for academic success and social participation. These challenges are particularly relevant given that the Brazilian National Common Core Curriculum (Base Nacional Comum Curricular [BNCC]) identifies literacy as a central objective of the early years of elementary education and establishes expectations for the development of foundational reading and writing skills (Ministério da Educação, 2018).

Brazilian-Portuguese is considered a semi-consistent orthography (Seymour et al., 2003). Those features are generally thought to facilitate reading and writing acquisition when compared with languages with less consistent orthographies (Borleffs et al., 2019). Despite these linguistic characteristics, many Brazilian children continue to experience substantial reading difficulties (Guimarães et al., 2025; Justi et al., 2023).

Thus, beyond access to education, the low reading performance of Brazilian students, reported by the Organisation for Economic Co-operation and Development (OECD, 2023) as being significantly below the OECD average (410 vs. 476 points), may reflect gaps in teacher preparation and the translation of scientific knowledge about literacy into educational practice rather than the complexity of the language. The BNCC emphasizes the development of phonological awareness, mastery of the alphabetic writing system, and foundational reading and writing skills during the early grades (Ministério da Educação, 2018). These expectations require teachers to possess knowledge of language structure, reading development, and learning difficulties such as dyslexia. However, the Brazilian National Report indicates that pedagogical practices do not always reflect advances in the science of reading, revealing a gap between research and classroom instruction (MEC, 2020).

Importance of teachers' knowledge

The discrepancy between Brazil's 7% general illiteracy rate and the 43% functional illiteracy observed among elementary school graduates highlights a substantial gap between school attendance and the development of effective literacy skills (IBGE, 2022; Instituto Paulo Montenegro, 2024). Because reading is a culturally acquired skill that requires explicit instruction, successful literacy acquisition depends heavily on the quality of classroom teaching. Accordingly, a substantial body of research demonstrates that reading proficiency is supported by systematic, evidence-based instruction and teachers' understanding of the phonological and orthographic mechanisms underlying word recognition (Brady & Moats, 1997; Moats, 2020; Treiman, 2018).

The link between teachers' knowledge and student literacy outcomes can be understood through models of teacher effectiveness. Desimone's (2009) framework proposes that teachers' subject-matter knowledge is a key determinant of instructional quality and, ultimately, student achievement. Building on this perspective, Blömeke

et al. (2022) and Guilbault et al. (2026) argued that teachers' cognitive resources influence student outcomes indirectly through teachers' situated skills (e.g., perception, interpretation, and decision-making) and the instructional processes they implement in the classroom. Specifically, the present study examines teachers' knowledge of phonological concepts, dyslexia, and literacy instruction approaches.

However, many educators may be affected by the Peter Effect, which suggests that teachers cannot effectively teach knowledge and skills they do not possess. In literacy instruction, limited knowledge of language structure may hinder teachers' ability to identify reading difficulties, provide evidence-based instruction, and support struggling readers (Applegate & Applegate, 2004; Binks-Cantrell et al., 2012; Guilbault et al., 2026).

Knowledge of phonological, orthographic, and morphological structures enables teachers to better assess student needs and support reading development (Freitas & Azoni, 2024). Teachers with stronger knowledge of language structure are better equipped to adapt instruction and foster reading fluency and comprehension (Moats & Foorman, 2003). Accordingly, incorporating findings from the science of reading into teacher preparation and classroom practice may promote more effective and equitable literacy instruction, particularly during the early stages of reading acquisition when mastery of sound–symbol correspondences is essential (Moats, 2020; Nolen et al., 1990).

Despite growing scientific consensus regarding the importance of explicit instruction in foundational reading skills, literacy education in Brazil continues to reflect longstanding tensions between different pedagogical traditions. Approaches emphasizing the social uses of written language and immersion in authentic texts have historically occupied a prominent place in teacher education and literacy practices. In contrast, phonics-based approaches advocate systematic and explicit instruction in letter–sound correspondences to support accurate and automatic word recognition (MEC, 2020). Although these perspectives are often portrayed as competing approaches, many contemporary researchers argue that effective literacy instruction requires both meaningful engagement with written language and explicit instruction in foundational reading skills.

Clarifying the current state of teachers' knowledge regarding dyslexia, language structure, and evidence-based literacy instruction is therefore essential. Such knowledge may help bridge the research-to-practice gap, inform teacher education initiatives, and ultimately contribute to ensuring that effective reading instruction is accessible to all students (Guilbault et al., 2026; Moats, 2020).

Teachers' knowledge about phonology

Despite broad consensus regarding the importance of teachers' linguistic knowledge for literacy development, studies across multiple countries have documented persistent gaps in both pre-service and in-service teachers' understanding of core language constructs. Evidence from Canada, the United States, Portugal, England, and New Zealand has identified weaknesses in teachers' knowledge of phonological awareness, phonics, morphology, and other foundational language concepts, even among participants with advanced levels of education (Amorim & Castelo, 2025; Binks-

Cantrell et al., 2012; Georgiou et al., 2025; Washburn et al., 2011b, 2016). Together, these findings suggest that difficulties in teachers' understanding of language structure are widespread rather than specific to a particular educational context.

Evidence from Brazilian studies

Despite the substantial Brazilian literature demonstrating the importance of phonological skills for literacy acquisition (Barbosa, 2005; Camilo & Mota, 2013; Konrad & Lorandi, 2019; Lima et al., 2020; Novaes et al., 2013; Silva & Godoy, 2020), relatively little attention has been devoted to examining whether teachers possess the knowledge necessary to support their development. In contrast to the growing international literature on teachers' knowledge of phonological awareness and language structure, only a limited number of empirical studies have focused on Brazilian teachers' knowledge of these constructs. Moreover, existing studies have generally involved small samples, focused on a narrow range of linguistic skills, or relied primarily on teachers' self-reported perceptions rather than direct assessments of knowledge.

For example, Almeida et al. (2022) surveyed 461 teachers in Mato Grosso and identified gaps in knowledge regarding how to stimulate and assess phonological awareness, despite widespread recognition of its importance. However, the study focused exclusively on phonological awareness and relied on teachers' perceptions and reported practices rather than direct assessments of linguistic knowledge. Similarly, França Filho (2015), using interviews and classroom observations with ten teachers, found only a partial understanding of phonological awareness, with knowledge that was often generic, weakly grounded, and inconsistently reflected in classroom practice.

Collectively, the available evidence suggests that Brazilian teachers may have important gaps in their understanding of phonological awareness and related aspects of language structure. However, the existing literature remains limited in scope and methodology, providing only a partial picture of teachers' knowledge. Few studies have directly assessed educators' understanding of the linguistic foundations of reading, and even fewer have examined knowledge across multiple domains relevant to evidence-based literacy instruction. Consequently, there remains a need for comprehensive investigations of Brazilian teachers' knowledge of phonology, dyslexia, and literacy instruction to better understand potential strengths and gaps that may influence classroom practice and student outcomes.

Teachers' knowledge about dyslexia

Because phonological processing difficulties are widely recognized as a core feature of dyslexia, teachers' knowledge of phonology is closely related to their ability to identify and support students at-risk of dyslexia. According to the International Dyslexia Association, dyslexia is a neurodevelopmental learning disability characterized by persistent difficulties in accurate and/or fluent word reading and spelling that occur despite effective instruction and often involve phonological and, in some cases, morphological processing difficulties (IDA, 2025). These difficulties may result in

reduced reading experience, comprehension problems, and broader academic and psychosocial consequences. Although there is general agreement regarding the neurodevelopmental nature of dyslexia, definitions vary across the literature, complicating research and limiting shared understanding in the field (Gonzalez, 2021; Washburn et al., 2011a). Because dyslexia follows a chronic developmental course, early identification is especially important, as earlier intervention is associated with better outcomes (Ozernov-Palchik et al., 2017; Snowling, 2013).

Teachers play a critical role in identifying children at-risk of dyslexia and implementing instructional practices adapted to students' needs. The National Reading Panel emphasizes the importance of specialized teacher knowledge for supporting students with reading difficulties (Ehri et al., 2001). Accordingly, research consistently indicates that when teachers receive training in the linguistic foundations of reading instruction, their knowledge increases and reading outcomes improve for struggling students (Al Otaiba & Lake, 2007; McCutchen et al., 2009; Piasta et al., 2009).

Despite this, research suggests that teachers often hold incomplete or inaccurate understandings of dyslexia. For example, Knight (2018) found that teachers in England and Wales demonstrated greater knowledge of the behavioral manifestations of dyslexia than of its underlying cognitive components. Importantly, inaccurate beliefs about dyslexia may negatively affect students' learning experiences (Yin et al., 2020). Similarly, a scoping review of parents', teachers', and clinicians' knowledge of dyslexia found that most research has been conducted in the United States, United Kingdom, and Australia (Bollig et al., 2026). The review further indicated that dyslexia is generally understood as involving difficulties with reading, spelling, and decoding, characteristics consistently identified as core features of the disorder.

International evidence also suggests that teachers' knowledge of dyslexia varies according to training opportunities and regional development. For instance, a large-scale study of Chinese-speaking early literacy teachers found that educators in less developed regions demonstrated lower levels of knowledge and higher rates of misconceptions and uncertainty than those in more developed regions (Yin et al., 2020). In the absence of systematic training, prior experience with students with dyslexia emerged as an important source of knowledge, underscoring the value of explicit professional preparation.

These findings are particularly relevant for Brazil, where substantial regional disparities in educational resources and teacher preparation persist. Examining whether similar patterns of uneven knowledge exist among Brazilian teachers is important for understanding how contextual factors may influence the identification and support of students with dyslexia.

Evidence from Brazilian studies

A review of the literature reveals few empirical studies on dyslexia knowledge in Brazil. Existing studies have identified significant gaps in teachers' ability to identify and support students with dyslexia. For example, interviews with ten Brazilian teachers found that, despite specialized training, many held inaccurate conceptions of dyslexia and reported that the topic was insufficiently addressed in both pre-service

and in-service education (Nascimento et al., 2018). Similarly, a study conducted in São Paulo found that Portuguese language teachers ($N = 27$) demonstrated limited knowledge of developmental dyslexia, with 73.2% attributing the disorder to emotional problems and 37.6% to motivational factors rather than to well-established genetic and neurobiological causes (Tabaquim et al., 2016).

Taken together, international and Brazilian studies indicate that teachers frequently demonstrate limited knowledge of dyslexia and continue to endorse misconceptions regarding its causes, characteristics, and identification. Because teachers play a central role in recognizing reading difficulties and providing instructional support, these knowledge gaps may have important consequences for students' literacy development. However, studies of dyslexia knowledge among Brazilian teachers remain scarce and are often based on small samples. Consequently, further research is needed to provide a more comprehensive understanding of Brazilian teachers' knowledge of dyslexia and related literacy concepts.

The present study

Empirical investigations of teachers' knowledge in these domains remain scarce in Brazil, despite teachers' central role in literacy instruction and the importance of such knowledge for informing teacher education, professional development, and literacy policy. Addressing this gap, the present exploratory study examined Brazilian teachers' knowledge of phonology, dyslexia, and literacy instruction approaches, as well as potential predictors of such knowledge, including professional training, teaching experience, and sociodemographic factors. By providing preliminary evidence on these associations, the study aims to inform future research, teacher training initiatives, and literacy policies in Brazil.

Method

Participants

The target population consisted of public-school teachers from urban and rural areas in a medium-sized city in Minas Gerais, Brazil. Participants included teachers of children aged 4–10 years, including literacy teachers (specializing in initial literacy instruction), special education teachers, and resource room teachers (specialists serving students with special educational needs in dedicated learning environments). This age range corresponds to the period in which the Brazilian National Common Core Curriculum (BNCC; Ministério da Educação, 2018) prioritizes the development of foundational literacy skills, making knowledge of language structure, dyslexia, and reading instruction particularly relevant. Pedagogues serving as instructional coordinators or school directors were also included. Four teachers who left the questionnaires blank were excluded, resulting in a final sample of 214 teachers.

Procedure

The study was approved by the Research Ethics Committee of the [blinded for review]. Questionnaires were administered in paper format in small groups during a single 45–60-min session conducted in a quiet space within participants' schools. Researchers were present throughout the sessions to provide clarification when needed.

Materials

Four questionnaires, developed based on relevant theoretical frameworks, were used for data collection.

Sociodemographic and occupational questionnaire

This survey asked participants to provide their age, gender, income, educational background, school location (urban/rural), internet access, years of service and secondary employment status.

Linguistic questionnaire

This questionnaire was developed based on previously published instruments assessing teachers' linguistic knowledge and literacy-related concepts (e.g., Binks-Cantrell et al., 2012; Moats, 1994; Moats & Foorman, 2003; Washburn et al., 2011b). Created by the first author and reviewed by content experts, the instrument was designed to assess foundational phonological concepts frequently identified in the teacher-knowledge literature. It consisted of nine closed-ended questions assessing key concepts of Brazilian-Portuguese, including phoneme (individual speech sound), consonant cluster (two or more consecutive consonants), syllable (basic unit of pronunciation), and alliteration (repetition of initial consonant sounds). One item required participants to identify the number of individual sounds in various Portuguese words (Appendix A). The questionnaire was previously used by Severino (2023), demonstrating satisfactory psychometric properties, and showed acceptable internal consistency in the present sample (Cronbach's $\alpha = .783$).

Dyslexia knowledge questionnaire

This instrument was adapted from Washburn et al. (2014), which originally comprised 19 statements describing the characteristics, symptoms, and causes of dyslexia. Following permission from the original author, the questionnaire was translated by content experts and research team members and contextualized for the Brazilian population. Modifications included changing items referring to dyslexia as "the primary cause" of reading difficulties to "one of the major causes," acknowledging the social and methodological factors that affect reading acquisition in Brazil (Morais, 2013). The adapted version initially contained 22 items: 21 closed-ended questions rated on a 4-point Likert scale (1 = false, 2 = probably false, 3 = probably true, 4 = true) and

one open-ended question. Items were reverse-coded where necessary so that higher scores reflected greater knowledge, and a composite score was calculated by averaging responses across items. The full 21-item version demonstrated excellent internal consistency (Cronbach's $\alpha = .961$).

Content validity was examined by evaluating each item for consistency with the scientific literature, relevance, and its ability to distinguish accurate knowledge from common misconceptions. Eight items reflected well-established findings in the dyslexia literature and aligned with consensus definitions and evidence-based educational practices, whereas ten reflected common myths or incorrect beliefs. Two items were analyzed separately because they assessed perceptions of teacher training rather than conceptual knowledge of dyslexia (e.g., Most special education teachers receive intensive training to work with children with dyslexia). Another item, Dyslexia occurs more frequently in boys than in girls, was excluded because evidence regarding sex differences in prevalence is mixed and influenced by referral and diagnostic biases, making the statement context dependent rather than unequivocally true or false (Doust et al., 2022). Following item selection procedures, 18 items were retained for the main analyses (Appendix B), yielding a reliability coefficient of Cronbach's $\alpha = .954$.

Reading instruction questionnaire

This instrument consisted primarily of open-ended questions assessing educators' knowledge of the whole-language approach, phonics-based instruction (systematic teaching of letter–sound correspondences), experience with students diagnosed with dyslexia, participation in professional development related to reading instruction, and knowledge of other instructional methods. Participants also rated their confidence in teaching students with reading difficulties on a scale from 1 (not confident) to 5 (very confident). Responses to the open-ended questions were analyzed using qualitative content analysis.

Data analysis

Descriptive statistics (means, standard deviations, frequencies, and percentages) were calculated for the sociodemographic, professional, and questionnaire variables. Item-level analyses of the linguistic knowledge and dyslexia questionnaires were conducted to identify patterns of correct responses and misconceptions. Inspection of skewness and kurtosis values revealed no substantial departures from normality and, together with the robustness of parametric tests to moderate violations (Norman, 2010), supported the use of parametric analyses. Independent-samples t-tests examined differences in knowledge scores across dichotomous variables (e.g., school location, specialization training, and experience with dyslexia), with Cohen's *d* reported as an effect size measure. Associations between questionnaire scores and continuous or ordinal variables were examined using Pearson's and Spearman's correlations, respectively.

To investigate factors associated with teachers' knowledge while accounting for the nesting of teachers within schools, linear mixed-effects models were conducted

with school included as a random intercept. Predictors significantly associated with the outcomes in preliminary analyses were entered as fixed effects. This approach enabled examination of each predictor's unique association with the outcome while accounting for school-level clustering.

For item-level analyses, dyslexia questionnaire responses were dichotomized as correct or incorrect according to the scientifically supported answer for each statement. This was done solely to facilitate the interpretation of misconceptions; continuous scores were retained for all other analyses.

Open-ended responses were analyzed using deductive thematic content analysis (Bardin, 2016; Caregnato & Mutti, 2006). Initial coding categories were developed from the study objectives and relevant literature on literacy instruction. Two members of the research team independently reviewed a subset of responses and resolved discrepancies through discussion until consensus was reached regarding the coding framework. The final scheme was applied to the full dataset, with any subsequent disagreements also resolved by consensus. Subcategories distinguished positive, negative, and mixed evaluations. Frequencies and percentages were calculated for each category, and responses concerning professional development were additionally classified according to the type and focus of training reported. Inferences were drawn from the presence or absence of coded elements, integrating theory and empirical data. Blank responses were excluded from analyses; consequently, discrepancies in frequencies and percentages reflect missing data.

Results

Teachers had a mean age of 41.79 years ($SD = 7.98$; range = 21–66). The sample was predominantly female (98.59%), worked primarily in urban schools (82.71%), and had widespread internet access (98.12%). Most participants held a degree in Pedagogy (55.6%), had completed a specialization course (72.12%), reported moderate confidence in their ability to teach reading and writing (59.11%), and had more than ten years of teaching experience (68.12%). Most had no prior experience working with students with dyslexia (79.90%), did not engage in other paid activities (72.95%), and reported household incomes of up to two Brazilian minimum wages (54.19%), a category generally associated with lower-income households in Brazil. Additional sociodemographic characteristics are presented in Table 1.

Linguistic knowledge

The questionnaire that examines the teachers' knowledge of characteristics of Brazilian-Portuguese had 15 items. Teachers obtained a mean score of 6.05 ($SD = 3.25$), corresponding to an average accuracy rate of 40.35%, with 156 teachers scoring below nine points (60%). We further analyzed this task at the item level to examine patterns of performance. Items related to the concept of phoneme (91.12%), identifying words that begin with the same sound (71.49%), and the concept of consonant clusters (67.29%) yielded high mean percentages of correct responses. However, substantial difficulties emerged in other areas: the item requiring participants to iden-

Table 1 Participant Sociodemographic Characteristics (N = 214)

Characteristic	Category	n (%)
Age (years)	<i>M (SD)</i>	41.79 (7.98)
School location	Urban	177 (82.71)
	Rural	37 (17.29)
Educational level	Pedagogy	119 (56.40)
	Normal Superior	60 (28.44)
	Other	32 (15.16)
Continuing education	Yes	150 (78.12)
	No	42 (21.88)
Teaching experience	Up to 1 year	6 (2.90)
	1–5 years	20 (9.66)
	6–10 years	40 (19.32)
	11–15 years	42 (20.29)
	16–20 years	47 (22.71)
	More than 20 years	52 (25.12)
Role	Classroom teacher	156 (74.29)
	Support teacher	10 (4.76)
	Literacy teacher	4 (1.91)
	Resource room teacher	3 (1.43)
	Pedagogical coordinator	12 (5.71)
	Other	25 (11.90)
Experience with dyslexia	Yes	41 (20.10)
	No	163 (79.90)
Other employment	Yes	56 (27.05)
	No	151 (72.95)
Monthly income (minimum wages)	Up to 2	110 (54.19)
	3–4	77 (37.93)
	5–6	13 (6.40)
	> 6	3 (1.48)
Confidence in teaching students with dyslexia	Not confident	9 (4.43)
	Slightly confident	61 (30.05)
	Confident	120 (59.11)
	Very confident	13 (6.41)

M = mean, *SD* = standard deviation. Percentages may not total 100% due to missing data and rounding

tify the fourth sound in a word *táxi* /'taksi/ 'taxi' (30.84%) and the item assessing the concept of voiced and voiceless consonants (13.55%) showed the lowest percentages of correct responses. Teachers also demonstrated low levels of accuracy on tasks involving phoneme counting (29% overall, minimum was 22% for *manhã* /ma'ɲã/ 'morning' and maximum was 40% for *lata* /'lata/ 'soda can'). Teachers had difficulties in this task even when the words were completely regular and the number of phonemes matched the number of letters. Overall, these findings suggest that while teachers show adequate knowledge of more explicit and surface-level concepts, important gaps remain in their understanding of more complex and applied phonemic processing skills that are critical for effective reading instruction.

We also examined the different professional and socioeconomic variables that could be associated with a higher score on this test using *t*-tests for the dichotomous variables and correlations for the others. Teachers working in rural schools (*M* = 7.27, *SD* = 3.73, *n* = 37) scored significantly higher than those working in urban schools

($M = 5.79$, $SD = 3.09$, $n = 177$; $p = .029$). We need to interpret this result with caution as we have a small sample of teachers from rural areas in our study. We found no associations for any of the variables studied ($ps > .05$). To examine further the relationship between teachers' knowledge about Brazilian-Portuguese and the various variables in the study we explored mixed-effects models.

Because professional role and school location were significantly associated with phonological knowledge in the preliminary analyses, these variables were included in a linear mixed-effects model. The model was used to examine whether teachers' phonological knowledge varied according to professional role and school location while accounting for the clustering of teachers within schools.

A linear mixed-effects model examined phonological knowledge as a function of teachers' school role and school location, with school included as a random intercept (Table 2). Type III tests revealed significant effects of both school role, $F(5, 197.30) = 3.60$, $p = .004$, and school location, $F(1, 27.41) = 4.82$, $p = .037$. Teachers working in rural schools scored significantly higher on phonological knowledge than those working in urban schools ($b = 1.58$, $SE = 0.72$, $t(27.41) = 2.20$, $p = .037$). In addition, relative to teachers classified as other (reference category; $M = 6.64$, $SD = 3.63$), special education teachers scored significantly lower on phonological knowledge ($b = -2.35$, $SE = 1.14$, $t(197.58) = -2.06$, $p = .041$), whereas literacy teachers scored significantly higher ($b = 3.57$, $SE = 1.65$, $t(197.52) = 2.17$, $p = .032$). Pedagogical coordinators also scored significantly lower than the reference group ($b = -2.44$, $SE = 1.07$, $t(197.02) = -2.27$, $p = .024$). No significant differences were observed between the reference group and classroom teachers or resource room teachers ($ps > .05$). These findings suggest that phonological knowledge varies systematically by professional role and school context. However, because some categories included relatively few participants, these results should also be interpreted with caution.

Knowledge of dyslexia

The scores in the dyslexia questionnaire, across the 18 items analyzed (total points = 54), with higher scores indicating a greater level of teachers' knowledge. Four teachers left the questionnaire completely blank stating "*I don't know anything about dyslexia*" or "*I am unfamiliar with the subject and lack sufficient understanding*;

Table 2 Linear Mixed-Effects Model Predicting Phonological Knowledge from School Role and School Location

Predictor	<i>b</i>	<i>SE</i>	<i>T</i>	<i>p</i>	95% <i>CI</i>
Intercept	6.42	0.68	9.40	< .001	[5.06, 7.77]
Classroom teacher	-0.54	0.67	-0.81	.419	[-1.85, 0.77]
Special education teacher	-2.35	1.14	-2.06	.041	[-4.60, -0.10]
Literacy teacher	3.57	1.65	2.17	.032	[0.32, 6.83]
Resource room teacher	-2.82	1.86	-1.52	.131	[-6.49, 0.85]
Pedagogical coordinator	-2.44	1.07	-2.27	.024	[-4.55, -0.32]
Rural school	1.58	0.72	2.20	.037	[0.10, 3.06]

The reference categories were *Other teachers* for school role and *Urban school* for school location. Positive coefficients indicate higher phonological knowledge scores relative to the reference category. School was included as a random intercept

therefore, I am not qualified to complete the sections above". Teachers who completed the questionnaire obtained a mean score of 36.23 ($SD = 4.73$; range: 19 – 48), corresponding to an average accuracy rate of 67.09%. We averaged the responses across items and found the mean score of averaged scores to be 2.05 ($SD = 0.28$) (total = 3).

Item-level analyses of the dichotomized *Likert-scale* questionnaire revealed substantial variability in item difficulty. The easiest items were those reflecting core, well-established characteristics of dyslexia: "*Dyslexia can cause difficulties with writing*" was answered correctly or partially correct by 96.9% of respondents and "*Teaching methods are irrelevant, exposure to authentic texts alone is sufficient for learning to read*" (false) by 95.3%, indicating strong consensus on these aspects. In contrast, the most difficult items reflected persistent misconceptions about dyslexia, with incorrect responses exceeding correct ones. These included "*Reading and intellectual abilities are related*" (false), which was answered incorrectly or partially incorrect by 57.9% of respondents, "*Parents with dyslexia are more likely to have children with dyslexia than parents without dyslexia*" (true), with 56.8% incorrect responses, and "*Certain medications have been shown to be effective in the treatment of dyslexia*" (false), with 56.5% incorrect responses. These findings suggest that while respondents demonstrated strong knowledge of fundamental aspects of dyslexia, misconceptions regarding its cognitive, genetic, and medical bases remain prevalent.

Two items addressing the training received to work with children with dyslexia were analyzed separately. Most teachers judged the statements "*Most teachers receive training to work with children with reading difficulties as part of their professional preparation*" (90.91%) and "*Most resource room teachers receive intensive training to work with children with dyslexia*" (73.12%) as false or partially false. These findings indicate a perceived lack of adequate preparation among teachers to effectively support students with dyslexia, both in general education settings and, to a lesser degree, in specialized resource rooms.

To examine variables associated with differences in teachers' dyslexia knowledge, a series of independent-samples t-tests were conducted using the dyslexia knowledge score and the dichotomous predictors: experience with dyslexia, educational background (having completed specialization), school location, and having a secondary employment. Teachers with experience with dyslexia scored significantly higher ($M = 2.13$, $SD = 0.22$) than those without such experience ($M = 2.03$, $SD = 0.30$), with a small effect size ($t(202) = -1.98$, $p = .049$; Cohen's $d = 0.28$). Teachers with further education also demonstrated significantly higher dyslexia knowledge ($M = 2.10$, $SD = 0.24$) than those without specialization ($M = 1.90$, $SD = 0.37$), with a medium-to-large effect ($t(190) = -4.29$, $p < .01$; Cohen's $d = 0.75$). In contrast, having a secondary job and school location was not associated with significant differences in dyslexia knowledge scores. Overall, the findings indicate that both direct experience with dyslexia and formal further education are associated with higher levels of teachers' dyslexia-related knowledge.

To further examine factors associated with teachers' dyslexia knowledge, associations were explored between the dyslexia knowledge score and other non-dichotomous sociodemographic and professional variables. No significant correlations

Table 3 Linear Mixed-Effects Model Predicting Dyslexia Knowledge

Predictor	<i>b</i>	<i>SE</i>	<i>t</i>	<i>p</i>	95% <i>CI</i>
Intercept	2.15	0.08	25.60	< .001	[1.98, 2.32]
No additional professional training	−0.18	0.05	−3.50	.001	[−0.28, −0.08]
No experience with dyslexia	−0.05	0.05	−0.89	.374	[−0.15, 0.06]

School was included as a random intercept. Omnibus tests indicated a significant effect of additional professional training, $F(1, 174.92) = 12.25$, $p = .001$, whereas school role and experience with dyslexia were not significant

(Spearman's rho) were observed between teachers' knowledge and the confidence in teaching children with dyslexia, income, years of service, or type of undergraduate teaching degree ($ps > .05$). Teachers' knowledge was negatively associated with age ($\rho = -.15$, $p = .043$), indicating that older teachers tended to report slightly lower levels of dyslexia-related knowledge. Teachers' knowledge also correlated with role in the school (e.g., resource teachers, classroom teacher; $\rho = .16$, $p = .004$).

Variables that showed significant associations with teachers' knowledge of dyslexia in the preliminary analyses (experience with dyslexia, educational background, and school role) were subsequently entered into a linear mixed-effects model. Teachers' knowledge of dyslexia score was specified as the dependent variable, with experience with dyslexia, educational background, and school role entered as fixed categorical predictors. School was included as a random intercept to account for the nesting of teachers within schools.

A linear mixed-effects model was conducted to examine whether dyslexia knowledge was associated with teachers' experience with dyslexia and additional professional training while accounting for the clustering of teachers within schools through the inclusion of a random intercept for school (Table 3). Type III tests of fixed effects indicated that additional professional training was a significant predictor of dyslexia knowledge, $F(1, 180.74) = 14.77$, $p < .001$, whereas experience with dyslexia was not, $F(1, 180.74) = 1.55$, $p = .215$. Parameter estimates showed that teachers without additional professional training scored significantly lower on dyslexia knowledge than those who had received such training, $b = -0.19$, $SE = 0.05$, $t(180.74) = -3.84$, $p < .001$. In contrast, experience with dyslexia was not significantly associated with dyslexia knowledge, $b = -0.07$, $SE = 0.05$, $t(181.70) = -1.24$, $p = .215$. These findings suggest that formal professional development beyond initial teacher education may contribute more strongly to dyslexia-related knowledge than direct experience working with students with dyslexia. After controlling for school role, experience with dyslexia, and school-level clustering, teachers without additional professional training scored, on average, 0.19 points lower on the dyslexia knowledge measure than teachers who had received additional professional training.

Knowledge of reading instruction methods

Teachers' perceptions of the whole-language approach were examined through open-ended responses categorized into thematic groups. Positive evaluations were most frequent, including clearly positive appraisals (19.62%, $n = 42$) and positive evaluations with reservations (10.28%, $n = 22$), together accounting for nearly 30% of responses. Negative evaluations were uncommon (1.86%, $n = 8$) and generally

focused on concerns about universal applicability. Smaller proportions of participants discussed implementation challenges (4.66%, $n = 10$), questioned the need for instructional methods (1.86%, $n = 4$), or emphasized the use of multiple or specific methods (3.72%). In addition, 6.54% ($n = 28$) highlighted the importance of teacher confidence and instructional competence, whereas 18.70% ($n = 40$) reported insufficient knowledge of the approach. Across categories, participants generally perceived the whole-language approach as widely used in Brazilian literacy instruction.

Teachers' perceptions of phonics-based instruction were organized into categories related to student learning, teachers' working conditions, and use of the method itself. Evaluations related to student learning accounted for 17.28% of responses, including positive (10.28%), positive with reservations (2.33%), and negative (4.67%) appraisals. Positive evaluations emphasized effectiveness, particularly for students with reading difficulties, whereas reservations and negative evaluations focused on concerns about mechanical instruction and limited contextualization. Responses concerning teachers' working conditions (9.34%) suggested that phonics instruction was viewed as effective but requiring substantial teacher expertise and training, and several respondents endorsed combining phonics with other instructional approaches.

Evaluations of the use of phonics accounted for 18.27% of responses, including positive (9.34%), positive with reservations (5.60%), and negative (2.33%) appraisals. References to phonics appeared in 44.89% of responses, whereas 55.11% provided no evaluation, which may reflect limited familiarity with the approach. Qualitative analyses further suggested that participants often viewed phonics instruction as less contextualized than the whole-language approach, despite evidence supporting its effectiveness when implemented within meaningful instructional contexts.

Teachers also reported professional development related to reading instruction. Responses ranged from no training to participation in multiple courses, most associated with governmental continuing education initiatives. A substantial proportion reported no specific training (16.82%), could not recall course names (5.60%), or did not respond (11.21%). Overall, the findings suggest greater exposure to training focused on *letramento* (the social uses of written language and participation in literacy practices) than on *alfabetização* (the systematic instruction of reading and writing skills, including decoding and encoding processes).

Discussion

This exploratory study examined Brazilian teachers' knowledge of phonology, dyslexia, and reading instruction. Teachers demonstrated limited phonological/phonemic knowledge despite its importance for reading acquisition, whereas dyslexia knowledge was moderate but marked by persistent misconceptions. Additional professional training was consistently associated with higher knowledge, while professional role and school context were associated with differences in phonological knowledge. Qualitative findings suggested greater familiarity with whole-language than phonics-based approaches and revealed perceived shortcomings, in preparation to support students with reading difficulties.

These findings suggest a disconnect between the linguistic demands of effective literacy instruction and the knowledge currently held by many educators. Participants demonstrated limited knowledge of some foundational linguistic concepts despite reporting confidence in their ability to teach reading and writing. This discrepancy between perceived preparedness and demonstrated knowledge suggests that self-confidence may not be a reliable indicator of readiness to deliver evidence-based literacy instruction and highlights the importance of objective assessments of teachers' knowledge (Dahl-Leonard et al., 2024; Guilbault et al., 2026). Given the central role of teachers in literacy acquisition, these findings are concerning and contribute to a limited but growing Brazilian literature on teachers' literacy-related knowledge.

The most striking result concerned phonological knowledge: teachers achieved a mean accuracy of only 40.3% on phonological tasks and experienced marked difficulty with phoneme identification and counting, even in regular words. Notably, although most participants (91%) were able to define a phoneme, they struggled to apply this knowledge in practice, illustrating a gap between declarative and procedural knowledge. This pattern exemplifies the Peter Effect, whereby individuals cannot effectively transmit knowledge they do not themselves possess (Applegate & Applegate, 2004; Binks-Cantrell et al., 2012). Literacy teachers scored higher than special education teachers and pedagogical coordinators on the phonological knowledge measure; however, this finding should be interpreted cautiously because the literacy teacher group was very small and the study was exploratory in nature.

On the dyslexia questionnaire, teachers achieved a mean accuracy of approximately 68%; however, their responses revealed several misconceptions. Most notably, 78.5% of participants incorrectly associated reading disabilities with intellectual difficulties. In addition, more than half endorsed inaccurate beliefs regarding the genetic basis of dyslexia and the effectiveness of medical treatments, including medication. These findings align with international research showing that educators often recognize the behavioral manifestations of dyslexia while lacking an understanding of its cognitive and neurological foundations (Knight, 2018; Zhang & Inoue, 2026). In Brazil, this knowledge gap has been attributed to the limited coverage of dyslexia in undergraduate programs and professional development initiatives (Nascimento et al., 2018). Consistent with this explanation, the present study found that the absence of specialized professional training was associated with lower knowledge scores, suggesting that current preparation may not adequately address neurodevelopmental disorders.

Qualitative analyses revealed greater familiarity with whole-language approaches than with phonics-based instruction. Although most teachers rejected the notion that exposure to authentic texts alone is sufficient for learning to read, phonics was frequently described as mechanical or decontextualized. This pattern may reflect the historical emphasis on broader literacy practices in Brazilian teacher education and is consistent with evidence documenting a gap between reading research and classroom practice in Brazil (MEC, 2020). Limited knowledge of phonics may restrict teachers' ability to implement systematic, evidence-based reading instruction.

These findings underscore the need for literacy policies and professional development grounded in the science of reading. Additional specialized training emerged as the strongest predictor of teacher knowledge, suggesting that targeted continu-

ing education may help address existing gaps. However, the fact that most teachers reported feeling inadequately prepared to address reading difficulties indicates that current training models remain insufficient. Literacy instruction in Brazil may benefit from an integrated framework that combines explicit and systematic instruction with meaningful engagement in literacy practices.

School role also emerged as a relevant factor, with literacy teachers outperforming special education teachers and pedagogical coordinators on language-based assessments. Because these professionals often support students experiencing learning difficulties, further research is needed to better understand literacy-related knowledge across educational roles and identify areas for professional development.

Interestingly, teachers working in rural schools scored higher on the linguistics questionnaire than those in urban schools. Although this finding should be interpreted cautiously given the relatively small number of rural teachers in the sample, it may have important implications for research and policy. One possible explanation is that structural features of small rural schools, such as closer professional collaboration, shared instructional responsibilities, and more cohesive learning communities, facilitate informal, practice-based teacher learning. However, this interpretation remains speculative because these factors were not directly assessed. Future research should examine the mechanisms underlying this association and determine whether it replicates in larger and more diverse samples.

Policy instability represents a substantial barrier to the consolidation of effective literacy practices in Brazil. For example, the *Política Nacional de Alfabetização* (PNA) introduced initiatives aimed at aligning literacy instruction with findings from reading research (Sargiani, 2022), but subsequent policy changes limited opportunities for sustained implementation and evaluation. More broadly, literacy policies in Brazil often suffer from limited continuity and integration into teacher training systems, reducing opportunities for long-term consolidation of evidence-informed practices.

The present study provides an important baseline for research on teacher knowledge in Brazil but also has several limitations. Data were collected from teachers in a single medium-sized municipality in Minas Gerais. Given substantial regional variation in literacy outcomes and educational conditions across Brazil, the findings may not generalize to all contexts. Future studies should include more geographically diverse samples to examine how regional differences shape teachers' literacy knowledge and access to professional development.

Another limitation concerns the assessment of teachers' linguistic knowledge. Although the linguistic questionnaire demonstrated satisfactory reliability and captured foundational phonological concepts relevant to reading acquisition, it focused primarily on phonological awareness and phoneme-level knowledge. Consequently, it may not fully represent the broader construct of language knowledge, which also includes morphology, syntax, semantics, and orthographic knowledge. Future research should employ more comprehensive measures to examine multiple dimensions of language structure and their relationship to literacy instruction.

In addition, the present study focused solely on in-service teachers and did not examine pre-service training or children's reading development. Longitudinal research is needed to investigate how undergraduate education, professional devel-

opment, and public policies influence teachers' knowledge over time and how these factors translate into classroom practices and student literacy outcomes. Future studies should also examine the origins of teachers' misconceptions to identify leverage points for intervention.

By addressing these limitations, future research can build a more comprehensive and policy-relevant evidence base to inform teacher education and literacy initiatives grounded in the science of reading. Such evidence is essential for reducing persistent educational inequalities and ensuring equitable access to effective reading instruction for all Brazilian children.

Conclusion

The findings indicate that although many teachers can identify basic symptoms of dyslexia, they continue to hold significant misconceptions, including the erroneous association between reading disabilities and intellectual ability. Participants also demonstrated limited knowledge of foundational phonological concepts and greater reliance on whole-language than evidence-based phonics approaches. The results suggest that specialized professional training and direct instructional experience are the strongest predictors of teacher expertise. These findings highlight the need for systematic literacy policies and updated teacher education programs in Brazil grounded in the science of reading.

Appendix A

Items of the Linguistic Questionnaire [translation to English in brackets].

1. Duas ou três consoantes juntas, pronunciadas de forma que cada uma delas mantenha sua própria identidade, são um (a):
[Two or three consonants together, pronounced in such a way that each one maintains its own identity, are a] Consoante silenciosa [Silent consonant]/Dígrafo [Digraph]/Ditongo [Diphthong]/Encontro consonantal [Consonant cluster]
2. Um fonema é: [A phoneme is]
Uma letra [A letter]/Um som [A sound]/Uma unidade de significado [A unit of meaning]/Um grafema [A grapheme]
3. Um grupo de letras pronunciável, que contém um som vocálico é um (a): [A pronounceable group of letters that contains a vowel sound is a]
Fonema [Phoneme]/Grafema [Grapheme]/Sílabas [Syllable]/Morfema [Morpheme]
4. Um exemplo de par de consoantes surda (desvozeada) e sonora (vozeada): [An example of a pair of voiceless and voiced consonants] B-D/P-B/T-F/G-J/C-S
5. Identifique o par de palavras que se iniciam com o mesmo som: [Identify the pair of words that begin with the same sound]
Pato – Bato/Casa – Cedo/Chato – Xerox/Fada – Salada
6. Identifique o par de palavras que terminam com o mesmo som: [Identify the pair of words that end with the same sound]
Caju – Gato/Sapo – Capô/Maré – Patê/Filé – Bule
7. Qual é o quarto som da palavra “táxi”? [What is the fourth sound of the word “táxi”]
/t/ /s/ /k/ /i/

8. Escreva o número de fonemas em cada uma das palavras: [Write the number of phonemes in each of the following words]

Manhã [Morning] /ma'ɲa/ Chão [Floor] /ʃaw/ Canto [Corner] /'kātu/ Hoje [Today] /'ozi/ Lata [Soda Can] /'lata/ Guerra [War] /'geha/ Quero [I want] /'keru/

*Phonetic transcription added here for clarification

9. O que é uma tarefa de aliteração? [What is an alliteration task]

Pedir à criança que fale a palavra SEM a primeira sílaba. [Ask the child to say the word without the first syllable]

Pedir à criança que escolha um par de palavras que comece com o mesmo som. [Ask the child to choose a pair of words that begin with the same sound]

Pedir à criança que troque os fonemas iniciais de duas palavras. [Ask the child to swap the initial phonemes of two words]

Perguntar à criança se duas palavras rimam. [Ask the child whether two words rhyme]

Appendix B

Eighteen items used in the analyses about teachers' knowledge of dyslexia and translation.

Ver letras e palavras de trás pra frente é uma característica da dislexia. [Reversing letters and words is a characteristic of dyslexia]

A dislexia pode causar dificuldades com a escrita. [Dyslexia can cause difficulties with writing]

Dislexia é uma condição para a vida inteira. [Dyslexia is a lifelong condition]

A dislexia pode ser causada por um ambiente familiar onde os pais não leem para seus filhos. [Dyslexia can be caused by a family environment in which parents do not read to their children]

Crianças com dislexia necessitam de mais instruções explícitas e sistemáticas de leitura que outras crianças de sua faixa etária. [Children with dyslexia require more explicit and systematic reading instruction than other children in their age group]

A dislexia pode ser tratada pelo uso de lentes coloridas ou outros tipos de corretores coloridos. [Dyslexia can be treated through the use of colored lenses or other types of colored overlays.]

Pais com dislexia são mais propensos a terem filhos com dislexia do que pais que não têm dislexia. [Parents with dyslexia are more likely to have children with dyslexia than parents without dyslexia]

Habilidades de leitura e habilidades intelectuais são relacionadas. [Reading skills and intellectual abilities are related]

Pessoas com dislexia têm dificuldades com a decodificação e o reconhecimento de palavras. [People with dyslexia have difficulties with decoding and word recognition]

A dislexia é uma dificuldade específica da Língua Portuguesa. [Dyslexia is a learning difficulty specific to the Portuguese language]

Crianças com dislexia são menos inteligentes do que crianças SEM dislexia. [Children with dyslexia are less intelligent than children without dyslexia]

Certos medicamentos têm se mostrado eficazes para o tratamento da dislexia. [Certain medications have been shown to be effective in the treatment of dyslexia]

A dislexia é uma dificuldade de aprendizagem que afeta o processamento da linguagem. [Dyslexia is a learning difficulty that affects language processing]

A dislexia afeta o desenvolvimento da criança exclusivamente na leitura. [Dyslexia affects a child's development exclusively in reading]

Crianças com dislexia também têm problemas com a escrita. [Children with dyslexia also have difficulties with writing]

Uma das maiores razões para as dificuldades causadas pela dislexia é devido a problemas visuais. [One of the main reasons for the difficulties caused by dyslexia is due to visual problems]

Dislexia e problemas emocionais são altamente correlacionados. [Dyslexia and emotional problems are highly correlated]

Métodos não são relevantes – para ensinar a ler, basta inundar a sala de aula com textos autênticos, de preferência apresentados nos seus portadores originais. [Teaching methods are not relevant—to teach reading, it is sufficient to immerse the classroom in authentic texts, preferably presented in their original formats]

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Declarations

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