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Development of Tools for Detecting Learning Difficulties in Primary School Students: Bibliometrics Analysis

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Abstract
This study seeks to identify publication trends, thematic focus, and characteristics of measurement tool use in academic studies on learning difficulties. The study was carried out using a systematic review of scientific articles published over the last decade. The analysis results show a significant increase in the number of publications, particularly between 2018 and 2024. This phenomenon reflects researchers' and educators' growing attention to the issue of learning disabilities, as well as the development of inclusive education approaches and a greater emphasis on the diversity of students' abilities. The most frequently discussed topics in the publications are reading difficulties, mathematical difficulties, specific learning disorders such as dyslexia, and intervention strategies and assessments used to support students with special learning needs. However, the study also revealed that the majority of the research instruments were partial and focused solely on academic aspects, with no comprehensive consideration of cognitive, socio-emotional, or environmental factors. As a result, this study emphasizes the importance of developing assessment instruments that are multidimensional, contextual, and adaptable to the needs of students. Such instruments are critical for early detection and more effective and relevant interventions. The findings also suggest a paradigm shift from a deficit-based to a support-based approach, in which individuals are active participants in the learning process. This study suggests that interdisciplinary collaboration to develop comprehensive measurement tools serve as the foundation for creating a more equitable and inclusive education system.

Keywords: learning difficulties;learning disability test; multidimensional instrument; primary education; primary schools

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INTRODUCTION

Primary school students are faced with new learning outcomes that are far more advanced than those of early childhood education (Kazu & İş, 2018). In addition to changes in learning outcomes, students are also faced with different roles in the learning process (Čepić & Papak, 2021). These changes can include cognitive, social-emotional, physical, and other aspects that are assessed in the learning process (McKown, 2017). In addition, there are differences in teaching methods (Tsai et al., 2016; Ullah & Iqbal, 2020). For example, in primary school, learning is structured, with more explicit instructions, whereas in early childhood education, students focus on playing, with learning taking place through the process of play. There is also a change in the role of teachers, who initially acted as facilitators but now act as learning process directors, instructors, and academic mentors.

In addition, learning outcomes that shift from focusing on the self-development abilities of early childhood education students to primary school students increase not only the focus on self-development abilities but also on academic achievement (Janius et al., 2024). Students with learning difficulties often become apparent only at the primary school level (Lewis, 1993). This is also due to changes in the form

of assessment methods, which previously involved observation of development (Ball et al., 2007), portfolios (McMullan et al., 2003), and narrative assessments at the primary school level (Nakhshab et al., 2015), but now focus on task-based assessments (Norris, 2016), simple tests (Demir, 2021), and formative-summative assessments (Mogboh & Okoye, 2019).

Teachers generally rely on task-based and summative assessments (Demir, 2021; Mogboh & Okoye, 2019), which, while efficient, often overlook underlying cognitive or socio-emotional causes. Existing assessment tools—such as the Indonesian Dyslexia Test (TDI) and Rapid Automatized Naming (RAN)—focus primarily on academic outcomes, offering limited insight into broader developmental contexts.

In the context of assessment, formative and summative assessments are often used to identify children who experience specific learning difficulties (e.g., in reading, writing, arithmetic) (Hall & Sheehy, 2018), identify specific areas of difficulty (e.g., working memory, visual perception, language comprehension) (Dolin et al., 2018), and develop appropriate intervention plans (therapy, tutoring, special reinforcement in class) (Bhat & Bhat, 2019). This can help the learning process for students in their efforts to achieve their learning goals.

The types used by teachers usually focus on academic ability. In addition, they usually observe and inventory behavioural aspects of socio-emotional achievements or self-development skills that students must possess (Hoge & Coladarci, 1989). If there is a tendency towards disorders, teachers will usually ask students to take psychological tests to assess their cognitive abilities and mental functions that may affect their academic performance (Finn et al., 2014; Kraft, 2019). In the context of learning disorders, there are already assessment tools such as the Indonesian Dyslexia Test (TDI), Phonological Test, and Rapid Automatized Naming (RAN) to detect learning disabilities such as dyslexia, dyscalculia, or dysgraphia.

The results of this assessment are important because they enable teachers to distinguish between students with disorders and students with obstacles. Students with disorders tend to require accommodative learning in order to achieve learning outcomes, while students with obstacles can be assisted through mentoring or reinforcement so that they can have the same abilities as their classmates and achieve learning outcomes. The purpose of this study is to observe the development of learning disability tests to assist teachers in identifying children with learning difficulties or disorders.

Previous bibliometric analyses (e.g., Al Husaeni & Nandiyanto, 2021; Hamidah et al., 2020) have mapped trends in digital learning and inclusive education, yet few have systematically examined how measurement tools for learning difficulties evolve and how they reflect socio-cultural contexts. This study addresses that gap, focusing on the global research landscape and its implications for Indonesia's educational needs.

METHODS

This bibliometric analysis used **Google Scholar** and **Scopus** databases. The search string applied was: ("learning difficulties" OR "learning disabilities" OR "learning disorders") AND ("assessment tools" OR "measurement" OR "diagnostic test") AND ("primary school" OR "elementary education"). The data were collected between January and March 2025. Inclusion criteria:

1. Journal articles (2014–2024).
2. English-language and peer-reviewed.
3. Focused on primary or elementary education.

Exclusion criteria:

- Conference proceedings, theses, or non-indexed publications.

- Studies not directly discussing measurement or assessment tools.

From an initial 980 results, duplicate and irrelevant items were removed, leaving 620 valid entries for analysis.

Software and Parameters:

Data visualization used **VOSviewer 1.6.20**, with the co-occurrence analysis of author keywords (threshold: minimum 5 occurrences). The *association strength* normalization method was applied to identify clusters and thematic density.

Quality Control:

To ensure source reliability, only publications indexed in Scopus or Google Scholar Core were included. Citation counts and journal indexing (Q1–Q4) were used as secondary quality indicators.

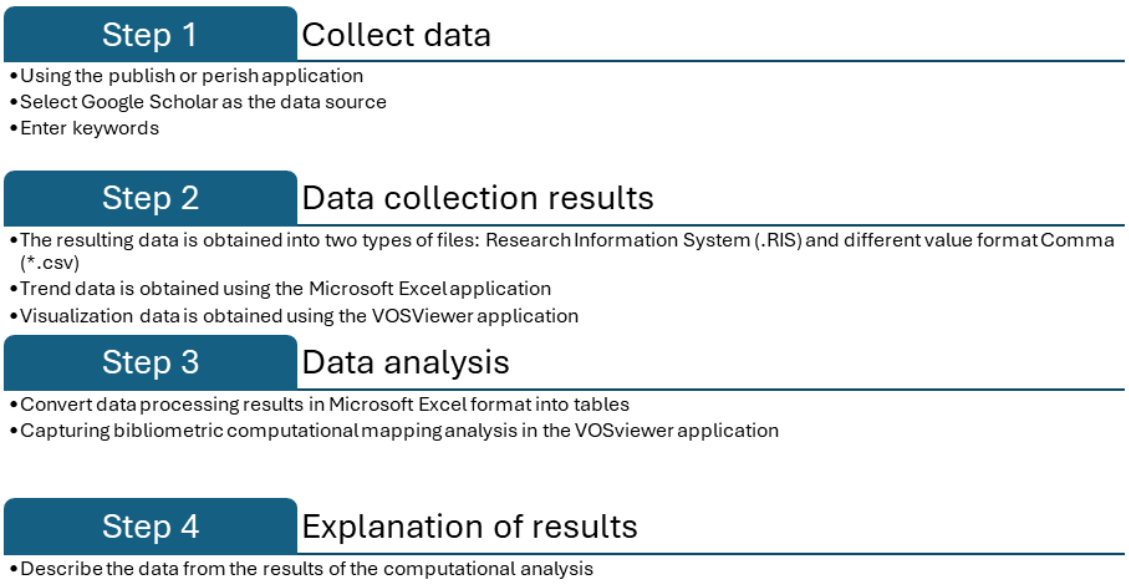

Figure 1. Research Stages

RESULT AND DISCUSSION

Figure 2 visually confirms that learning difficulties are no longer a minor issue in education, but rather an important topic in current scientific research. This lays a solid foundation for the creation of evidence-based interventions and more comprehensive and relevant measurement tools. Increasing Trend: The number of articles has gradually increased between 2014 and 2024. This suggests that the topic of learning difficulties has received increased attention from researchers, particularly in the last decade. Peak Number of Articles: The year with the most publications was 2023, indicating that research on learning difficulties was very popular at the time.

From 2018 to 2021, there was a greater increase. This can be attributed to the growing emphasis on inclusive education, the implementation of a more adaptive curriculum, and the promotion of mental health in the educational setting. Meanwhile, from 2022 to 2024, the number of articles increased significantly, particularly in 2023 and 2024. This can be attributed to the post-COVID-19 pandemic period, when learning achievement gaps became a global concern, prompting more research into identifying and addressing students' learning challenges.

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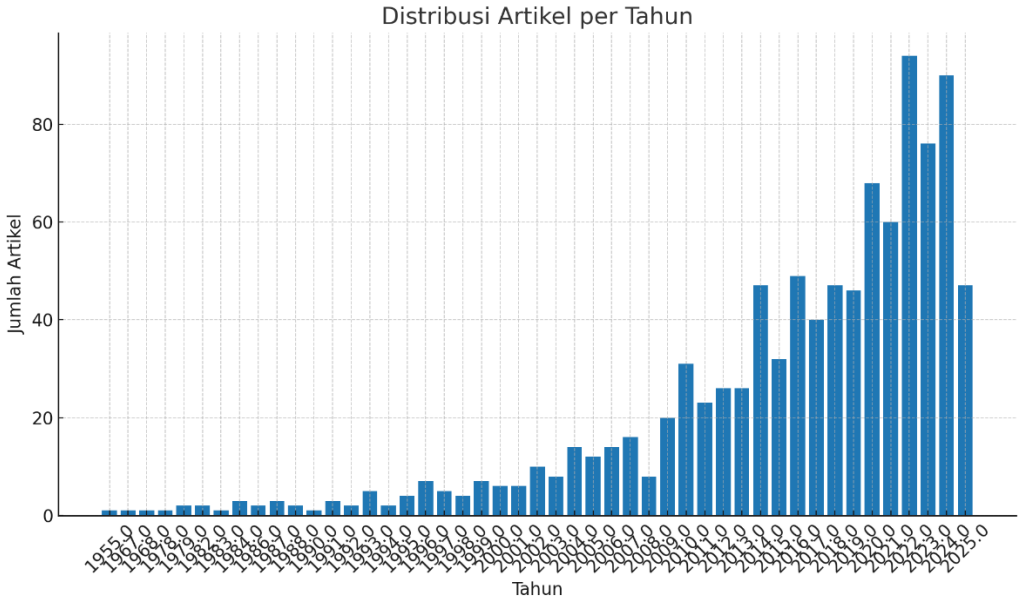

Figure 2. Distribution of articles per year

Network Visualization

Network visualisation analysis using VOSviewer produced five main cluster (Figure 3):

1. Yellow Cluster: Diagnosis and Specific Disorders.
   a. Keywords Key terms: disorder, diagnosis, dyslexia, autism spectrum disorder, developmental language disorder, prevalence.
   b. Explanation: This cluster represents a medical and diagnostic approach to understanding learning disabilities. Articles in this cluster go into great detail about diagnostic criteria for specific learning disorders like dyslexia, dysgraphia, dyscalculia, and autism spectrum disorder (ASD). The use of assessment tools to identify developmental language disorders and their prevalence in specific populations. Theoretical reviews and meta-analyses on diagnostic validity and its implications for early intervention.
   c. Key Findings: The scientific understanding of learning disorder categories is crucial for developing educational approaches, as evidenced by its high citation and keyword frequency.
2. Blue Cluster: Effectiveness of Strategies and Learning Evaluation
   a. Keywords: effect, strategy, effectiveness, comprehension, fluency, vocabulary, post test, pre test.
   b. Explanation: This cluster includes experimental and quasi-experimental studies that evaluate the efficacy of different learning strategies for students with learning disabilities. Focus: Using reading strategies like repeated reading, phonics, or visual scaffolding to improve comprehension. Pre- and post-test evaluations serve as indicators of intervention success. The application of technology and media-based learning to improve fluency and vocabulary mastery.
   c. Key findings: Temporal visualization reveals that this cluster has been highly dominant over the last 5-10 years. This indicates a paradigm shift toward evidence-based approaches and quantitative assessment of learning outcomes.

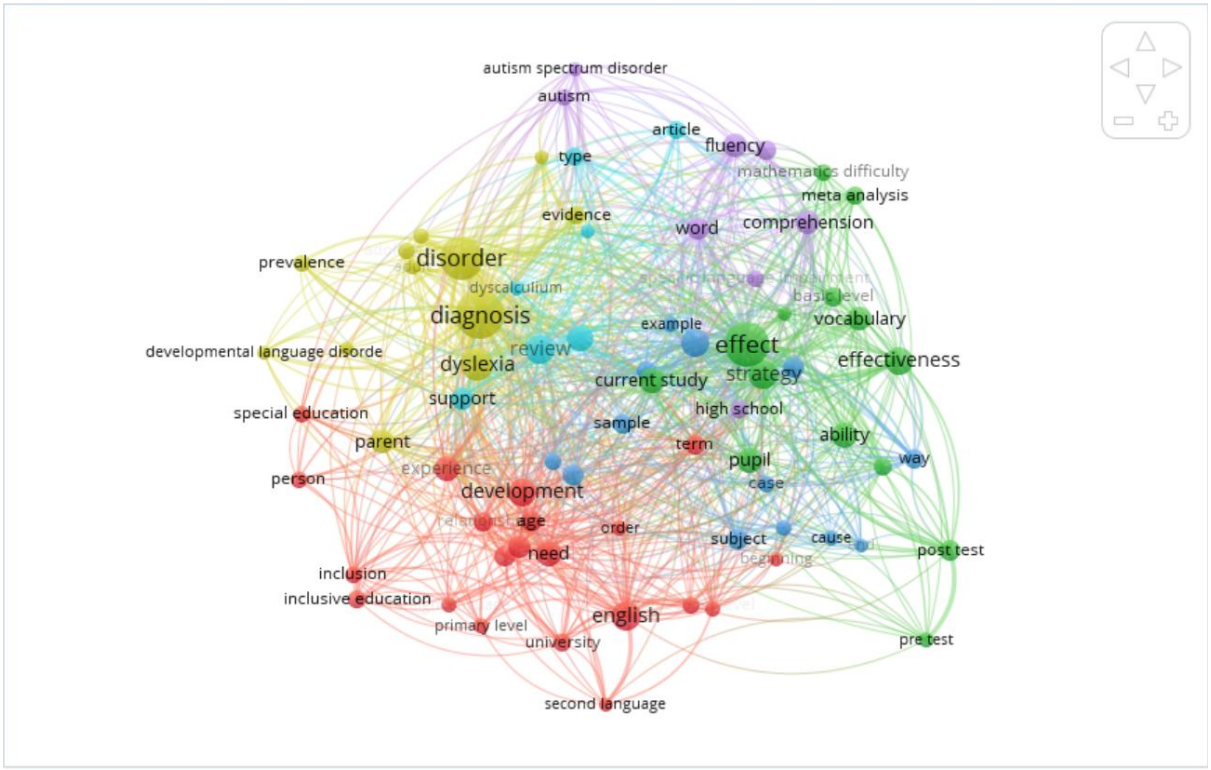

Figure 3. Network Visualization

3. Red Cluster – Child Development, Support, and Needs
   a. Key words: development, needs, parents, experience, support, special education
   b. Explanation: Topics in this cluster discuss the context of individual development and the importance of support from parents and the education system. Articles in this cluster tend to use a qualitative approach or longitudinal studies.
   c. Key points: Children's special needs based on developmental stages, such as emotional and social needs. The role of parents in early detection of learning difficulties and their involvement in intervention programmes. The experiences of students with special needs in inclusive education systems or special education.
   d. Key findings: This topic emphasises the importance of ecological and systemic approaches, where family and school environmental factors are key to comprehensively addressing learning difficulties.
4. Blue-Red Cluster – Language Challenges and Multilingual Learning
   a. Key words: English, second language, university, primary level, subject, sample
   b. Explanation: This cluster reflects studies on learning difficulties in the context of students learning in a second language, particularly English. Common issues raised: Barriers in understanding subject matter due to differences between the native language and the language of instruction. Academic challenges at the university and primary education levels when students have not yet mastered the language of instruction. Pedagogical strategies to improve subject comprehension in the context of English as a Second Language (ESL).
   c. Key Findings: This topic highlights the importance of linguistic sensitivity in designing learning for bilingual and multilingual students, particularly in developing or multicultural countries.Klaster Biru-Kemerahan – Tantangan Bahasa dan Pembelajaran Multibahasa

5. Green Cluster – Basic Language and Literacy Skills
   a. Key words: reading comprehension, words, fluency, vocabulary, basic level, mathematics difficulty
   b. Explanation: The main focus in this cluster is on basic skills that form the foundation for further learning. The study covers: Difficulties in understanding reading texts and their impact on the entire learning process. The relationship between basic reading skills and performance in other areas, including mathematics. Strategies for improving literacy through phonemic practice, morphological awareness, and comprehension exercises.
   c. Key Findings: This topic is consistently a major focus in the literature because literacy skills are a key predictor of academic success.Klaster Hijau – Keterampilan Bahasa dan Literasi Dasar

Overlay Visualization

The overlay visualisation illustrates the development of research themes over time, as shown by various studies (Lestari et al., 2025; Yustiana et al., 2025). In Figure 4, colour variations indicate the development of research topics. This visualisation highlights emerging trends in research on learning difficulties, with the use of learning difficulty assessment tools beginning in 2012 (Figure 4). Based on temporal visualisation (colour gradation), it is clear that more recent studies (marked in yellow-green) address the effectiveness of learning and the evaluation of results, including post-tests, pre-tests, effectiveness, and students. This demonstrates a shift in the emphasis from theoretical studies to evidence-based practice in dealing with learning difficulties.

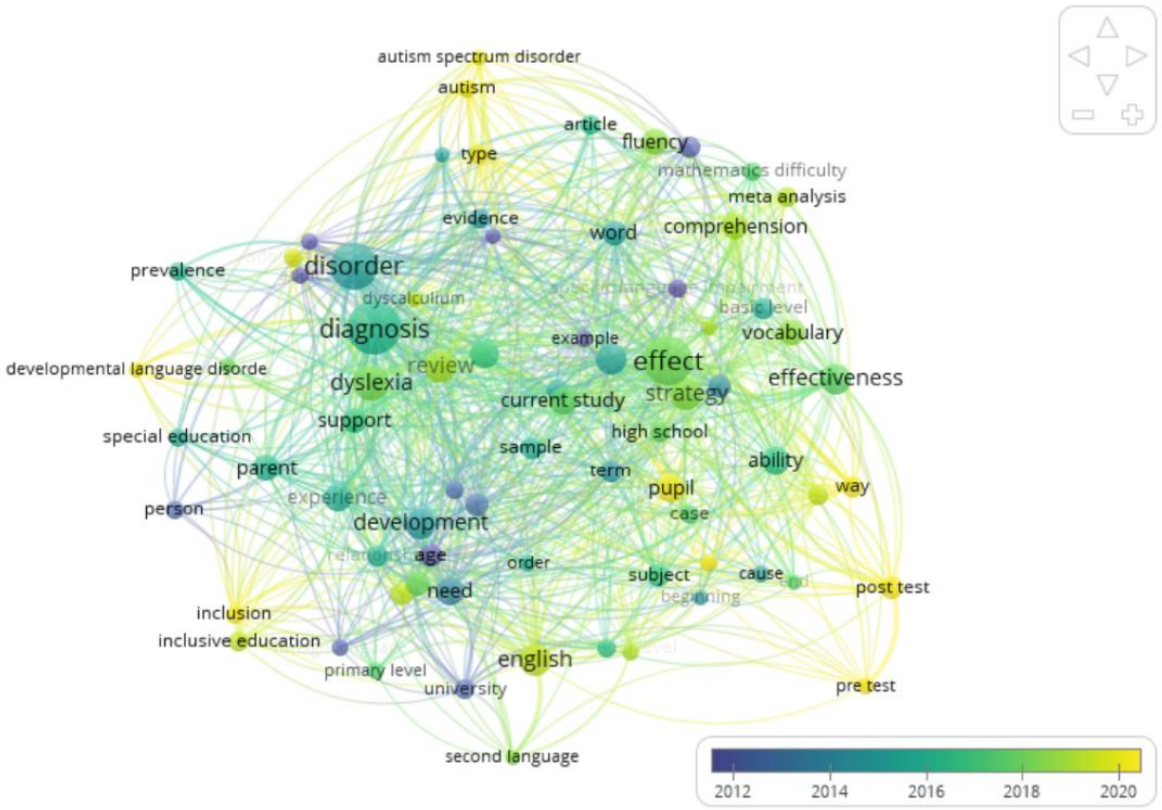

Figure 4. Overlay Visualization

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Density Visualization

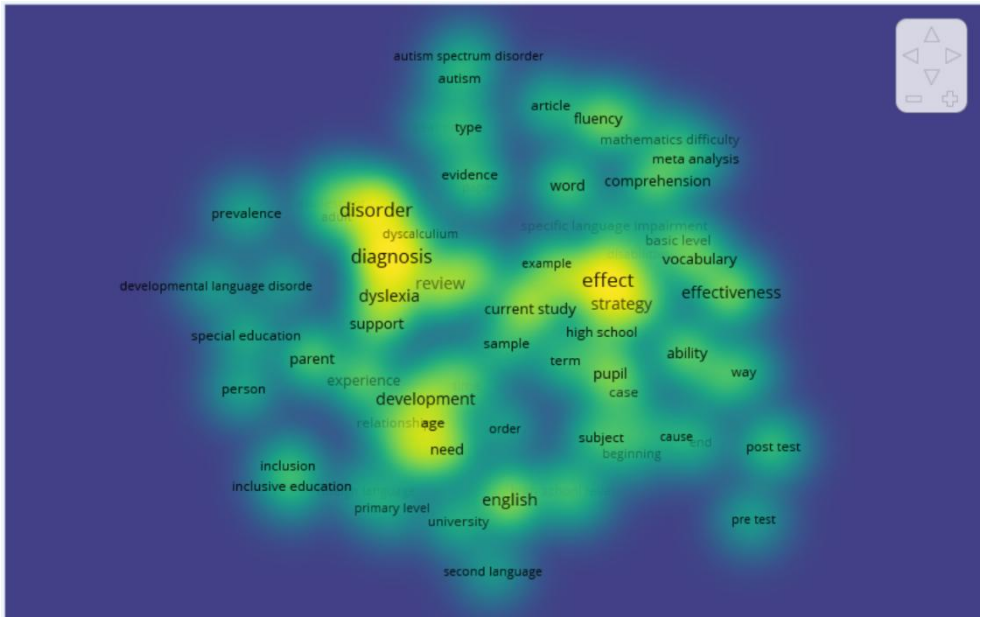

Figure 5. Density Visualization

Figure 5 depicts the density visualisation. According to Pertz et al. (2020), term density is calculated using the frequency of occurrence and co-occurrence, which are represented by size and color. The brightness of the yellow color and the diameter of the labelled circles increase proportionally with the frequency of term occurrence (Waltman & Van Eck, 2012), indicating that certain topics are more commonly researched. The number of studies decreases as the colour blends into the green background (Al Husaeni & Nandiyanto, 2021). The density map reveals that keywords such as disorder, diagnosis, effect, strategy, and development are the focus of the literature, implying that these words appear most frequently and are central to the studies examined.

Analysis of Learning Difficulties Among Tool Users

Learning disabilities are neuropsychological conditions that impair a person's ability to receive, process, and express information (Fletcher & Grigorenko, 2017). Because they are invisible, valid and reliable measurement tools or instruments are required to accurately identify these difficulties, both at the screening stage and during in-depth assessments.

Based on a review of 25 scientific articles from credible sources, it was discovered that the majority of studies on learning difficulties use academic achievement tests and standard cognitive assessments as the primary method for identifying learning barriers in students. This is consistent with the literature, which shows that academic achievement tests such as the local tests like the TKD are widely used due to their ease of administration and ability to identify gaps between students' potential and performance (Gyamfi et al., 2022). Additionally, cognitive tests such as the WISC or CFIT are frequently used as tools to understand the information processing aspects that underpin learning disorders (Giofrè et al., 2017).

Only about 12% of the articles discuss the use of measurement tools designed or adapted specifically for local cultural and linguistic contexts, such as Indonesia or the Southeast Asian region. Most continue to rely on international instruments without reporting revalidation for local populations. This demonstrates a gap between practical field needs and the availability of context-appropriate

measurement tools. As a result, it is necessary to adapt foreign measurement tools to local contexts and national curricula, as well as to develop new scales. Several recent articles emphasize that learning difficulties are not only related to academic performance, but also to emotional factors, motivation, and social context. As a result, the measurement approach should be multidimensional, including cognition, emotional regulation, adaptation, self-efficacy, and motivation. As a result, assessment methods that focus solely on academic performance or cognitive function are frequently insufficient to provide a complete picture of a student's condition.

As a result, measuring instruments must be capable of fully capturing this complexity. The development of multidimensional measuring tools will not only improve diagnostic accuracy, but will also help to create a more equitable, responsive, and inclusive educational system (Csapó & Molnár, 2019). The results of learning difficulties tests can assist teachers in developing targeted Individual Learning Plans (ILPs) that are not solely based on academic performance (Britton & Spencer, 2020; Wong & Rashid, 2022). Furthermore, multidimensional instruments can be used by a variety of stakeholders (teachers, psychologists, counselors, and parents) within a single integrated assessment framework (Kilgus et al., 2015; Riccio & Rodriguez, 2007). This will encourage collaborative, cross-disciplinary practices for meeting students' learning needs.

Socio-Emotional and Environmental Aspects

Few studies integrate emotional regulation, motivation, or family support into assessment design, despite evidence showing their impact on learning outcomes (Ng et al., 2022). This gap underscores the need for multidimensional tools incorporating academic, emotional, and ecological variables especially in culturally diverse contexts like Indonesia.

Implications for Inclusive Education

The findings suggest a paradigm shift from deficit-based to support-based assessment. Tools should not only diagnose deficits but also inform Individual Learning Plans (ILPs) and adaptive teaching (Britton & Spencer, 2020; Wong & Rashid, 2022). Policymakers are encouraged to integrate socio-emotional metrics into national diagnostic systems to ensure equitable education for all learners.

CONCLUSION

A review of scientific publications on learning difficulties revealed that academic interest in this topic has been steadily increasing over the last decade. A significant increase occurred, particularly after 2018, indicating a greater sense of urgency among the scientific community about this matter.

The most frequently discussed topics are reading difficulties, math learning difficulties, dyslexia, intervention strategies, and assessment tools. This demonstrates that literacy and numeracy skills are the primary focus when identifying and addressing learning difficulties. Furthermore, the intervention and assessment aspects are thoroughly discussed, highlighting the need for more effective and evidence-based intervention strategies.

In terms of measurement tools, studies show that most research still takes a fragmented approach, assessing only one or two aspects of learning difficulties. Learning difficulties, on the other hand, are multidimensional, encompassing cognitive, social-emotional, and contextual components (for example, learning environment and family support). As a result, the development of comprehensive and multidimensional instruments is critical for more accurate early detection and targeted interventions. An examination of the topic's evolution reveals that in recent years, the emphasis has shifted away from simply identifying learning difficulties and toward developing intervention strategies and utilizing technology in assessment. This represents a shift from a deficit-based paradigm to a more inclusive, support-based paradigm that focuses on developing children's potential.

Bibliometric mapping revealed growing global attention to learning difficulty assessment. The study contributes uniquely by highlighting the absence of localized, culturally validated tools in Indonesia and by integrating socio-emotional perspectives into bibliometric analysis.

Future research should involve interdisciplinary collaboration among educators, psychologists, and technologists to develop adaptive, multidimensional instruments aligned with inclusive education frameworks.

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