

Visual Analysis of Research Hotspots and Trends in Young Children's Deep Learning from 2018 to 2025

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Abstract

Against the backdrop of educational digitalization, deep learning plays a critical role in fostering young children's learning dispositions and holistic development. This study analyzes 195 journal articles on "young children's deep learning" published between 2018 and 2025 in the CNKI database. Using bibliometric and visualization methods with CiteSpace 6.1.R6, the study examines researchers, institutions, research domains, and emerging hotspots to identify the field's characteristics, trends, and research emphases. Literature was retrieved using the topic search "young children's deep learning," and 195 valid publications were obtained after screening. Terms such as "teacher support" and "support strategies" have gradually emerged, indicating a shift in research focus from the learning subjects to the implementers of educational practices and their operational mechanisms. Between 2020 and 2022, keywords including "play strategies," "early childhood education," and "practical research" demonstrated a sustained upward trend. These findings highlight an intensified emphasis on enhancing the quality of young children's deep learning through pedagogical approaches, instructional models, and structured learning activities.

Keywords: Deep Learning, Bibliometric Analysis, Citespace, Educational Digitalization, Research Hotspots, Early Childhood Education, Knowledge Mapping

Introduction

With the rapid advancement of digital information technology, modern education places increasingly higher demands on learners' abilities to acquire knowledge and exercise creativity (Sun, 2023). In this context, deep learning plays a positive and facilitative role in helping students master learning methods, dare to explore the unknown, and enhance imagination and innovation capabilities (He & Li, 2005). In today's educational landscape, deep learning is crucial for fostering high-quality learning dispositions in young children (Zhang, 2020). However, as a key element in promoting their holistic development, research on deep learning in early childhood education still exhibits significant gaps, urgently requiring further investigation (Qiu, 2018).

Therefore, a systematic study of the research trends and hotspots in young children's deep learning can help address these deficiencies and advance the development of early childhood education in China.

The use of visualization techniques to analyze complex data represents an effective and efficient research method. Visual analysis not only fosters the development of novel ideas but also provides readers with a foundation for objective observation and evaluation (Wijk, 2005). Simultaneously, acknowledging the contributions of specific authors on a given topic can help identify experts in the field and lay the groundwork for academic collaboration (Akbari et al., 2020). Highly cited publications hold significant academic value and influence within specific disciplines. Studying these texts allows for a deeper understanding of the evolutionary trajectory and fundamental principles of academic domains (Chander et al., 2022). Co-occurrence keyword analysis is a commonly employed technique in bibliometric analysis (Gorzen-Mitka et al., 2020). By applying this method, researchers can examine the structure and patterns of a designated research dataset, thereby achieving a comprehensive understanding (Ren & Abdullah, 2024a).

This paper conducts a comprehensive analysis of research on young children's deep learning from 2018 to 2025, encompassing temporal variations in publication volume, disciplinary distribution, high-contributing authors and co-authorship networks, distribution of major journals, co-occurrence analysis of keywords, and a review of highly cited papers. Provide important references for optimizing research directions and integrating academic resources.

Research Objectives

1. To present the research overview and developmental trajectory of the field of young children's deep learning using bibliometric and visualization methods.
2. To identify and analyze the core themes, evolutionary pathways of research hotspots, and frontier trends in young children's deep learning research.
3. To identify research gaps based on the analysis of the current state and propose targeted suggestions for future research.

Research Methods and Data Collection

Research Methods

"CiteSpace is an information visualization software developed using the Java language. It enables the quantitative analysis of literature collections in specific domains to identify key evolutionary pathways within disciplinary fields, and facilitates the analysis of disciplinary evolution and research frontiers through the generation of a series of visual maps" (Chen, 2006, pp. 359-377). This study employs bibliometric and visual analysis methods, utilizing CiteSpace 6.1.R6 software developed by Dr. Chaomei Chen of Drexel University, USA. By configuring appropriate parameters, the software generates author collaboration networks, institutional collaboration networks, keyword co-occurrence networks, keyword clustering, and timeline maps to analyze literature related to deep learning in early childhood. This approach aims to reveal research characteristics and developmental trends within the field. Through visualization techniques, the study identifies hotspots, trends, and potential academic connections within this research domain.

Data Collection

This study retrieved literature from the China National Knowledge Infrastructure (CNKI) database using the search query "Topic = 'Young Children's Deep Learning'". As research in this area emerged relatively late in China, the timespan was limited to Chinese publications from 2018 to 2025, with academic journals being the primary literature type. A total of 220 relevant articles were initially identified. To ensure data accuracy and validity, the researchers screened topics, keywords, and abstracts. From the 220 retrieved documents, 25 were excluded due to incomplete information or irrelevant content, resulting in a final selection of 195 articles that met the criteria of high relevance and significance. These documents will be explicitly used for in-depth visual analysis to uncover research hotspots and trends in young children's deep learning.

Research Findings

Researcher Analysis

Using CiteSpace software, a visual mapping analysis was conducted on the 195 data entries by selecting "Author" as the node type. The resulting data displayed in the upper left corner of Figure 1 shows "N=162, E=48". Here, "N" represents nodes, indicating author occurrence points, where larger font sizes correspond to higher frequency of appearance in the dataset. "E" represents edges, denoting connections between authors, with thicker lines indicating higher co-occurrence frequency in the same publications, thus reflecting collaborative relationships among authors (**Chen et al., 2015**). The author collaboration network consists of 162 nodes and 48 edges. As shown in Figure 1, the research field of young children's deep learning has not yet formed a distinct core author group. Although some collaboration exists among authors, the overall co-authorship network remains relatively sparse. Consequently, research in this field has not achieved significant concentration or collaboration levels, suggesting potential insufficient academic exchange and cooperation among researchers. To promote in-depth development of young children's deep learning research, it is recommended to strengthen collaboration among authors and facilitate knowledge exchange.

To more clearly present the key relevant research institutions, this study utilized relevant data from CiteSpace to compile Table 2, which systematically summarizes information on the top 14 institutions with the most concentrated research output in this field. As shown in Figure 2, institutions researching young children's deep learning are predominantly higher education establishments and kindergartens. According to the data in Table 2, seven research institutions—including Northeast Normal University and Central China Normal University—have relatively prominent publication outputs, each having published three articles. Beyond these seven institutions, the remaining top 14 institutions have predominantly published 1-2 articles, collectively reflecting a research landscape characterized by "core institutions leading with multi-stakeholder participation." This distribution pattern intuitively demonstrates that research on young children's deep learning has fostered in-depth exploration within the field of early childhood education. Relevant studies have not only gained widespread attention and recognition at the higher education level but have also demonstrated significant research value and practical influence in frontline practice settings such as kindergartens. The collaborative efforts between these two types of institutions provide dual support for both theoretical advancement and practical implementation in this field.

Table 2

Research Information of Major Institutions

No.	Publication Count	Starting Year	Institution
1	3	2020	Faculty of Education, Northeast Normal University
2	3	2024	Leshan City Experimental Kindergarten
3	3	2019	School of Preschool Education, Beijing Institute of Education
4	3	2020	School of Education, Central China Normal University
5	3	2018	Nantong Municipal Government Agency No.2 Kindergarten, Jiangsu Province
6	3	2023	Ximochi Kindergarten, Tong'an District, Xiamen City, Fujian Province
7	3	2022	Zhangping City Experimental Kindergarten, Fujian Province
8	2	2020	CITIC Kindergarten Affiliated to Northeast Normal University
9	2	2021	School of Education, Central University for Nationalities
10	2	2022	School of Education Science, Nanning Normal University
11	2	2022	School of Educational Science, Jilin Normal University
12	2	2020	Teachers College, Changshu Institute of Technology

No.	Publication Count	Starting Year	Institution
13	2	2023	School of Education, Guangzhou University
14	2	2021	Faculty of Education, Guangxi Normal University

Research Field Analysis

On the CiteSpace operation interface, the node type was selected as "Keyword" to perform scientific mapping visualization analysis, resulting in the keyword co-occurrence map shown in Figure 3. The map displays keywords with larger font sizes, such as "deep learning," "young children," "area activities," "area play," and "support strategies," indicating their high frequency of appearance across the 195 publications. Additionally, other keywords with relatively smaller font sizes, such as "multiple evaluations" and "home-kindergarten collaboration," are observed, suggesting that scholars also maintain research interest in these related topics.

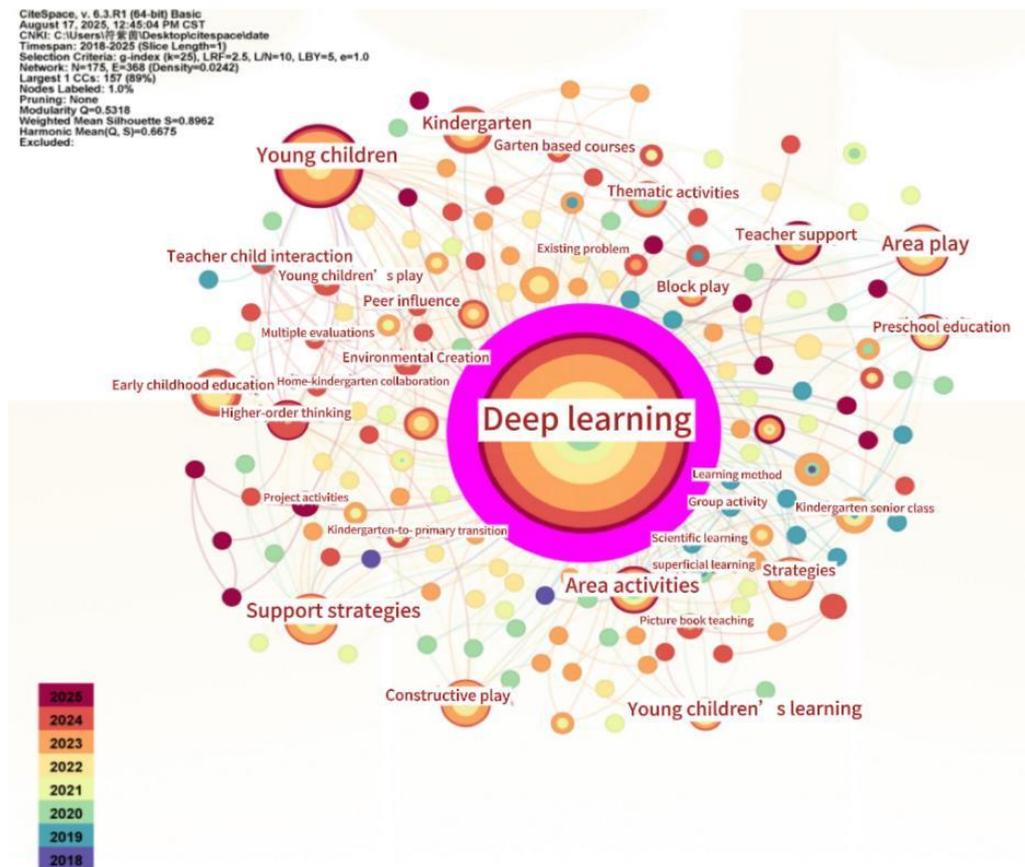


Figure 3. Keyword Co-occurrence Map

Given the substantial number of keywords present in Figure 3, this study employed the keyword clustering function of CiteSpace to enhance the precision of summarizing the research domain. By aggregating closely related keywords from Figure 3 into clusters, the keyword cluster map shown in Figure 4 was generated. This cluster map emphasizes the structural characteristics between clusters, highlighting key nodes and significant connections (Chen, 2006). CiteSpace provides two metrics based on network structure and cluster clarity:

the Modularity Q-value (Q) and the Mean Silhouette value (S). A Q-value greater than 0.3 indicates a significant cluster structure, while an S-value reaching 0.7 is considered convincing. The data displayed in the upper left corner of Figure 4 show $Q = 0.5318$ and $S = 0.8962$, demonstrating that the cluster structure of this map is highly significant and the results are robust.

In Figure 4, the clusters are arranged in descending order of document count, represented by nine distinct color-coded groups. These vividly illustrate the diverse themes and research directions within the field of young children's deep learning. The research directions provide a coherent and systematic framework, facilitating the understanding of each cluster's unique contribution to the study of young children's deep learning. Through analysis of the core keywords within each cluster, the following observations can be made:

1. The first cluster, "Young Children's Learning" (#0), as the cluster with the largest volume of literature, it focuses on core issues in young children's learning. Keywords such as "early childhood teachers," "questioning strategies," "guidance strategies," and "picture book teaching" demonstrate the research emphasis on the interconnection between young children's learning and instructional support strategies.
2. The second cluster, "Young Children" (#1), this cluster encompasses multiple aspects related to children themselves. Keywords like "constructive play" and "mathematics teaching" reflect research on children's development in areas such as motor skills and academic learning.
3. The third cluster, "Kindergarten" (#2), using kindergarten as the primary research context, keywords including "thematic activities," "classroom teaching," and "local resources" highlight studies on promoting deep learning in kindergarten instruction and utilizing indigenous resources.
4. The fourth cluster, "Teacher Support" (#3), centers on the role of teachers in early childhood education. Keywords including "learning habits," "kindergarten-to-primary transition," and "science games" highlight research related to teachers' roles in supporting deep learning, cultivating learning habits, facilitating transitions, and guiding scientific games.
5. The fifth cluster, "Support Strategies" (#4), investigates support methods in early childhood education. Keywords like "daily living activities," and "play environment" indicate a focus on support strategies for toddlers in daily activities and play environments.
6. The sixth cluster, "Area Games" (#5), concentrating on the impact of area play on child development, keywords such as "material provision," "thinking skills," and "child behavior" underscore the research focus on how area play contributes to lifelong development, enhances cognitive qualities, and influences behavior.
7. The seventh cluster, "Early Childhood Education" (#6), this cluster addresses the comprehensive scope of early childhood education, examining broader educational frameworks and systems.
8. The eighth cluster, "Young Children's Play" (#7), exploring the relationship between play and child development, this cluster identifies "teacher-child interaction," "home-kindergarten collaboration," "peer influence," and "environmental creation" as key factors influencing children's play experiences.
9. The ninth cluster, "Area Activities" (#8), focuses on educational practices in specific contexts. Keywords such as "promotion strategies," "kindergarten senior class," and

"Kunming City" highlight research on educational strategies for specific age groups in area activities and regional characteristics.

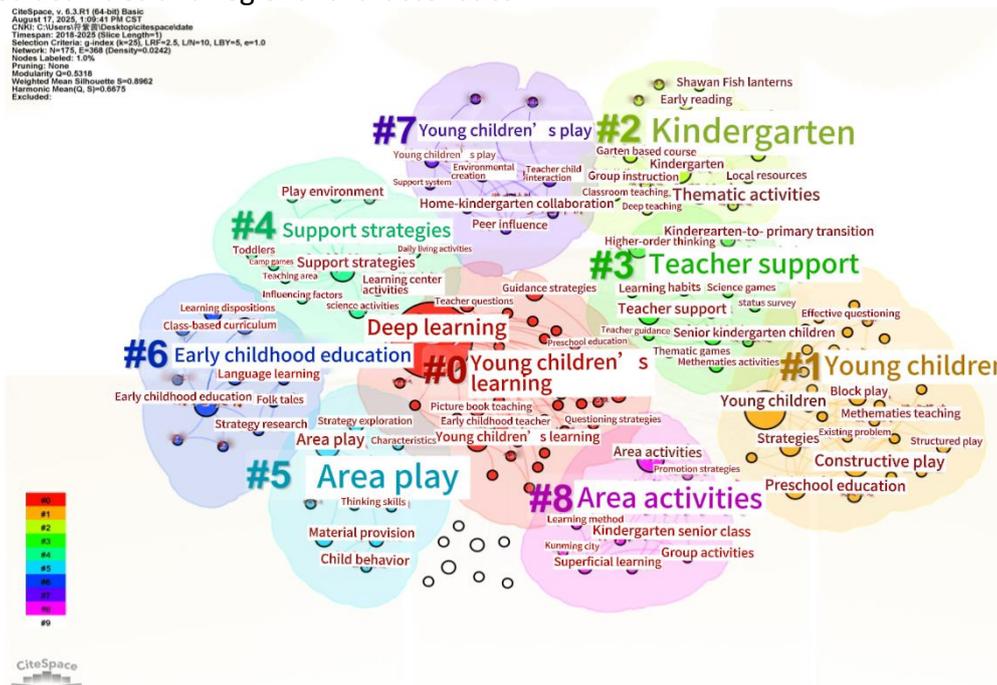


Figure 4. Keyword Cluster Map

To more clearly present the keyword clusters and the relationships among keywords within each cluster, this study utilized relevant data from CiteSpace to compile Table 3. These keyword clusters help identify the core research domains within the study of young children's deep learning in China. As shown in Figure 4 and Table 3, the nine clusters of research on young children's deep learning all center around the field of early childhood education and exhibit a characteristic pattern of "core themes leading with sub-themes extending." The core themes are "Young Children's Learning" (37 publications) and "Young Children" (31 publications), whose significantly higher publication volumes establish them as central research objects in the field, reflecting a primary emphasis on both the "process of young children's learning" and the "group of young children themselves." Sub-themes such as "Kindergarten" and "Teacher Support" demonstrate relatively lower publication counts. These sub-themes focus on specific contexts, supporting agents, and strategic methods, indicating an extension of research toward practical details.

According to Table 3, the clusters "Young Children's Learning" ($S=0.988$), "Kindergarten" ($S=0.953$), "Area Activities" ($S=0.949$), "area play" ($S=0.945$), and "Early Childhood Education" ($S=0.919$) all exhibit S -values greater than 0.9, classifying them as high-focus clusters ($S \geq 0.9$). The Silhouette (S) value indicates that higher values reflect stronger keyword associations within clusters and more well-defined research directions (Chen, 2006). For instance, in the "Young Children's Learning" cluster, keywords such as "outdoor autonomous play," "intangible cultural heritage resources," and "supportive strategies" all revolve around "learning environments and support pathways for young children," demonstrating highly unified themes. Meanwhile, the "Area Activities" cluster focuses on "kindergarten senior class," "Kunming City," and "promotion strategies," reflecting targeted research on specific age groups and geographical contexts. Table 3 also reveals that "Teacher Support" ($S=0.899$),

"Young Children's Play" ($S=0.874$), "Support Strategies" ($S=0.733$), and "Young Children" ($S=0.748$) fall within the medium-focus cluster range ($0.7 \leq S < 0.9$). Among these, the "Young Children" cluster has the lowest S -value (0.748), with keywords covering "climbing area," "mathematics teaching," and "effectiveness," indicating that research on the child population spans a broad range of domains but remains relatively dispersed in focus.

Table 3
Cluster Summary

Cluster	Doc Count	S Value	Start Year	Representative Keywords within Cluster
#0 Young Children's Learning	37	0.988	2021	Young Children's Development(1.79); Home-Kindergarten Play(1.79); Outdoor Autonomous Play(1.79); Supportive Strategies(1.79); Intangible Cultural Heritage Resources(1.79)
#1 Young Children	31	0.748	2021	Climbing Area(0.62); Status Quo(0.62); Mathematics Teaching(0.62); Effectiveness(0.62); Implication(0.62)
#2 Kindergarten	14	0.953	2021	Deep Learning(0.12); Classroom Teaching(0.1); Shawan Fish Lantern(0.1); Local Resources(0.1); Children's Activities(0.1)
#3 Teacher Support	14	0.899	2021	"Bubble Exploration"(0.15); Young Children's Deep Learning(0.15); Learning Habits(0.15); Kindergarten-Primary Transition(0.15); Scientific Games(0.15)
#4 Support Strategies	12	0.773	2020	Deep Learning(0.12); Toddlers(0.1); Influencing Factors(0.1); Daily Living Activities(0.1); Play Environment(0.1)
#5 Area Games	11	0.945	2020	Deep Learning(0.12); Lifelong Development(0.1); Area Creation(0.1); Thinking Quality(0.1); Child Behavior(0.1)
#6 Early Childhood Education	11	0.919	2021	Deep Learning(0.12); Language Learning(0.1); Convergence Publishing(0.1); Strategy Research(0.1); Children's Books(0.1)
#7 Young Children's Play	10	0.874	2021	Deep Learning(0.15); Home-Kindergarten Linkage(0.06); Multiple Evaluations(0.06); Support System(0.06); Peer Influence(0.06)
#8 Area Activities	9	0.949	2019	Promotion Strategies(0.11); Kindergarten Senior Class(0.11); Kunming City(0.11); Teaching Strategies(0.11); Early Childhood Stage(0.11)

Research Hotspot Analysis

The number of publications over time serves as a key indicator for measuring the developmental trajectory of a specific academic field. Conducting a comprehensive historical statistical analysis of the keyword distribution in these publications and generating corresponding timezone maps are crucial for assessing the current stage of the field and predicting its future trends and dynamics (Qiu et al., 2012, pp. 78–89). By integrating CiteSpace software to summarize the research burst points in the field of young children's deep learning from 2018 to 2025, this study aims to identify research hotspots across different phases of the domain's evolution.

Figure 5's keyword timezone map demonstrates that "deep learning" functions as the core keyword, maintaining sustained and extensive connections throughout the analyzed period, thereby serving as the central anchor for research on young children's deep learning from 2018 to 2025. Its strong associations with fundamental categories such as "young children's learning," "young children," and "kindergarten" indicate that studies primarily focus on early childhood education contexts, aiming to reshape the learning process through deep learning principles and establish the field's foundational scope—exploring integration pathways for deep learning within the core environment of young children's learning.

From the perspective of keyword evolution, the emergence of terms like "teacher support" and "support strategies" reflects a shift in research focus from the learning subject (young children) to educational implementers and support mechanisms. The appearance of practical scenario keywords such as "area play," "area activities," and "young children's play" signifies a deepening of research into specific forms of practice within early childhood education. Based on this timezone map, the research trajectory can be delineated as evolving from theoretical concepts of deep learning to the involvement of teachers and young children as primary agents, and further extending to practical scenarios like area activities and play. This progression illustrates the implementation pathway of young children's deep learning research, transitioning from abstract to concrete and from singular to multifaceted approaches.

From 2020 to the present, the connections between "deep learning" and multiple keywords have intensified, with practical terms such as "teacher support" and "area play" playing significant roles. This indicates that the research has entered a maturation phase, emphasizing the integration of theory and practice.

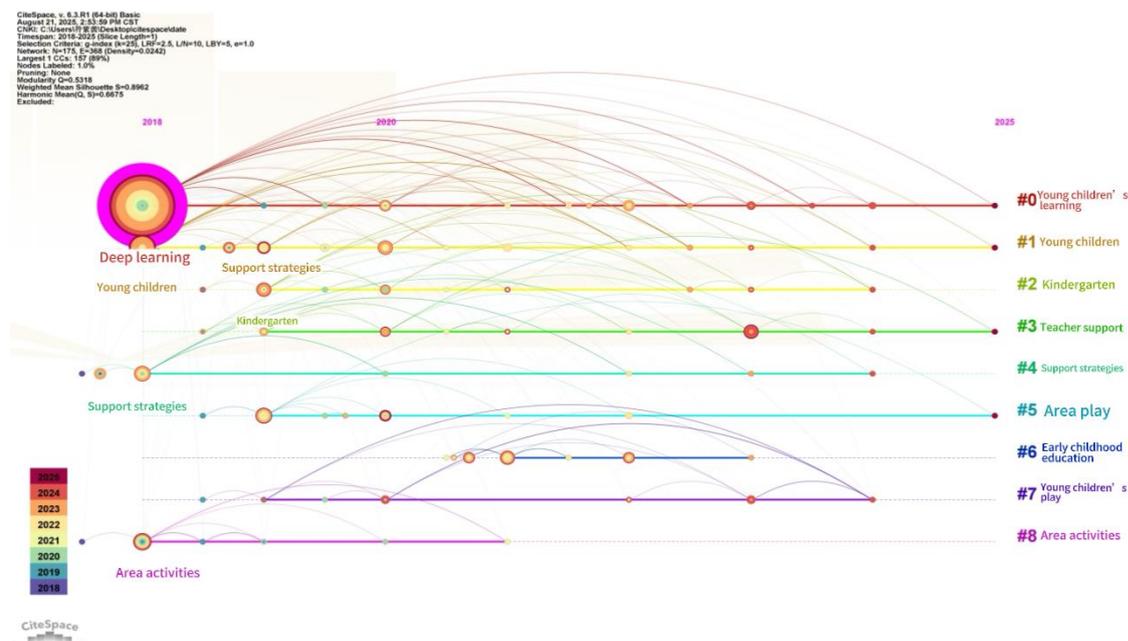


Figure 5. Keyword Timezone Map

Keyword burst detection serves as an effective method for identifying sudden shifts and emerging trends in research topics within a specific academic discipline (Chen, 2006). This analytical approach not only reveals the evolution of hotspot topics but also enables researchers to evaluate the impact and sustainability of different research themes (Li & Chen, 2016). As a valuable tool for frontier detection and hotspot analysis, keyword burst mapping helps scholars quickly identify critical nodes and turning points in disciplinary development, clarifying shifts in research focus and direction across different periods (Liu, 2008, pp. 648–653).

By monitoring changes in keyword citation frequency, burst detection can highlight terms that experience rapid increases in citations over short timeframes. This facilitates the identification of emerging research hotspots and frontier issues within the discipline, allowing researchers to trace developmental trajectories and grasp dynamic trends. Keywords demonstrating both high burst strength and prolonged duration typically represent research themes with substantial influence and sustained attention in the field. Conversely, briefly emergent keywords may reflect transient hotspots or transitional research directions during disciplinary evolution. Through systematic analysis of keyword burst patterns, researchers can gain deeper understanding of field development dynamics, thereby providing valuable reference for research topic selection.

The keyword burst detection map in Figure 6 reveals that "area activities" experienced a significant burst during 2018-2019, indicating concentrated research on the integration of young children's deep learning with area activity scenarios during this period. Subsequently, "superficial learning" and "context" emerged as burst terms in 2019-2020, reflecting a research shift toward comparing deep learning with superficial learning and examining the role of contextual factors in young children's deep learning. From 2020 to 2022, sustained bursts were observed for "play strategies," "early childhood education," and "practical research," demonstrating continued focus on play-based approaches and the implementation

of educational practices. After 2022, extended bursts appeared for "guidance strategies," "strategies," and "play," signaling refined exploration of support strategies for deep learning. The recurrent emergence of strategy-related keywords across multiple periods suggests that "how to support young children's deep learning through strategies" represents a core concern throughout the research timeline. The persistent association of "play" underscores its importance as a vehicle for deep learning in early childhood. Analysis of keyword bursts in Figure 6 identifies "strategies" and "play" as sustained research hotspots in young children's deep learning, suggesting that measures should be taken to promote sustainable development in this field.

Top 12 Keywords with the Strongest Citation Bursts



Figure 6. Keyword Burst Detection Map

Future Research Suggestions

Scholars Zhao Yanhua and Yang Lu contend that deep learning in young children constitutes meaningful learning (Zhao & Yang, 2024, pp. 90–91). In contrast, Ye Pingzhi, Qiao Tianqi, and Wang Xinxin posit that deep learning represents not merely a capability but a dynamic learning process and outcome. They emphasize that its core lies in fostering students' problem-solving abilities, encompassing key competencies such as self-directed learning, higher-order thinking, transfer and reconstruction, as well as integration and innovation (Ye et al., 2025, pp. 58–66).

The distinction between "Area Activities" and "Area Play" lies in the fact that "Area Activities" refer to specific activity spaces and forms designated by kindergartens according to educational goals and children's developmental needs, encompassing various types such as play, manipulation, and exploration. "Area Play," on the other hand, constitutes the core component within "Area Activities."

In kindergarten instructional activities, play serves as the fundamental form of learning, characterized by its autonomy, non-utilitarian nature, imaginative quality, and capacity for

enjoyment. It constitutes a voluntary, self-initiated, and pleasurable social activity that engages children's imagination, representing the most effective means for preschoolers to acquire knowledge. Meanwhile, area activities in kindergarten represent a common instructional format that functions as a crucial vehicle for children's self-directed learning and a significant mechanism for supporting deep learning (Tian et al., 2025, pp. 91–94). These activities actively contribute to children's holistic development and the enhancement of their comprehensive abilities.

Analysis of Research Trends and Identification of Core Issues

Figure 6, the keyword burst detection map, reveals distinct research trends. "Area Activities" experienced a significant burst during 2018-2019, yet its prominence declined notably in subsequent years. In contrast, "Play" has emerged with high frequency since 2022, underscoring its crucial role as a primary vehicle for young children's deep learning and establishing it as a sustained research hotspot within the field. Further analysis of weak association points indicates that the connection between "Area Activities" and "Deep Learning" remains relatively sparse. This analysis suggests that while the importance of "Area Activities" as an educational context has been recognized, the specific pathways for effectively promoting deep learning within them remain unclear.

Concurrently, this study also finds that since 2020, the associations between "Deep Learning" and practice-oriented keywords such as "Teacher Support" and "Area Play" have significantly strengthened. This trend indicates that current research has entered a deepening phase focusing on specific implementation pathways. Integrating the perspective of Scholar Chen Ruixi—who proposed that "challenges" encountered during play serve as opportunities to trigger deep learning, and that teachers' effective support, stimulation, and guidance based on children's interests are key to addressing these challenges (Chen, 2021)—it can be inferred that the breakthrough for future research lies in deeply exploring how "Teacher Support" operates concretely within the core context of "Area Play."

Therefore, synthesizing research trends and theoretical understanding, future research should explicitly adopt "Area Play" as the primary practical context and key entry point. By systematically deepening the exploration of teacher support strategies within play contexts, the core challenges of promoting deep learning in "Area Activities" can be effectively addressed, thereby advancing the sustainable development of this field.

Existing Research Foundation and Directions for Deepening

A review of relevant literature reveals, on one hand, the practical tensions in facilitating deep learning within area activities. These include the conflict between predesigned and emergent elements in activity design, the balance between standardized environments and contextual adaptability, the contradiction between consistent and flexible material provision, and the dynamic relationship between child autonomy and teacher support. On the other hand, several scholars have proposed valuable support strategies from different angles. For example, encouraging children to formulate preliminary play plans to enhance purposefulness (Chen & Zhang, 2024); employing strategies such as optimizing materials, utilizing mind maps, employing effective questioning, and emphasizing the learning process in science area activities (Wang & Zhang, 2025, pp. 90–96); or systematically constructing a

support framework across multiple dimensions including environment, interaction, collaboration, and assessment (Cai et al., 2024, pp. 67–69).

However, existing strategies often remain as principled or categorical suggestions. How these strategies interact in real-time with the deep learning behaviors that emerge during children's dynamic and complex play processes to form personalized support plans requires further in-depth investigation. Consequently, future research needs to build upon this foundation and focus further, striving to explore "how to construct a dynamic, contextualized system of teacher support strategies within area play, based on children's real-time deep learning performance and developmental needs."

Specific Research Recommendations

Based on the above analysis, the following specific recommendations are proposed:

1. Focus on the Core Research Question: It is recommended to refine the research perspective, centering the core question on "how to develop tailored teacher support strategies applicable within area play that can promote young children's deep learning." This question aims to connect the theory of "Teacher Support" with the practice of "Area Play," directly addressing a current weak point in the field.
2. Design Differentiated Practical Pathways: At the practical level, research should move beyond generic strategies. Differentiated guidance plans should be designed and validated according to the characteristics of various types of area play, such as exploratory, constructive, and role-playing games. Examples include developing heuristic questioning strategies, progressive scaffolding strategies, and situational facilitation strategies, respectively.
3. Adopt Integrated Research Methods: Methodologically, it is recommended to adopt a mixed-methods approach combining video analysis (to quantify behavior frequency) and narrative observation (to qualitatively analyze interaction mechanisms) (Li et al., 2025). Simultaneously, an action research model should be introduced. Organizing teachers to conduct seminars on the "evidence-based practice of support strategies" can establish a closed-loop research pathway of "practice-reflection-optimization," ensuring the research outcomes possess both academic rigor and practical feasibility.

In summary, advancing research on deep learning within young children's area activities and play requires integrating theoretical exploration with empirical innovation under the premise of clearly defining the core context. Future research should strive to reveal the mechanisms of interaction between support strategies and children's deep learning behaviors, and to develop systematic, operational, and evaluable practical tools. This will provide solid academic support and practical guidance for children's holistic development and the enhancement of educational quality.

Theoretical and Contextual Contributions

Theoretical Contributions

Addressing the Bibliometric Gap in Young Children's Deep Learning Research

This study systematically analyzed 195 relevant publications from the CNKI database spanning 2018 to 2025 by utilizing the CiteSpace visualization software, thereby filling a gap in bibliometric research within the field of young children's deep learning. By constructing co-authorship networks, institutional collaboration networks, keyword co-occurrence networks, and keyword cluster maps, the study systematically reveals the academic landscape and

developmental trajectory of research on young children's deep learning. This approach not only addresses the theoretical gap in using data-driven methods to uncover the overall research ecosystem and knowledge structure of this domain but also establishes a verifiable, comparable analytical benchmark and a diachronic observation framework for subsequent research.

Constructing the Theoretical Framework for Young Children's Deep Learning Research

Through keyword cluster analysis, this study identified nine core thematic clusters in young children's deep learning research, including "Young Children's Learning," "Young Children," "Kindergarten," "Teacher Support," "Support Strategies," "Area Play," "Early Childhood Education," "Young Children's Play," and "Area Activities," thereby forming a relatively comprehensive theoretical framework. In particular, the timeline analysis revealed the evolutionary trajectory of research hotspots: from the focus on "Area Activities" in 2018–2019, to the comparative studies on "Surface Learning" and "Context" in 2019–2020, followed by sustained attention to "Play Strategies," "Early Childhood Education," and "Practical Research" from 2020 to 2022, and finally the deepened exploration of "Guidance Strategies," "Strategies," and "Play" after 2022.

Contextual Contributions

Providing Evidence-Based Insights into Research Hotspots and Trends to Guide Practical Innovation

The timezone map and burst detection map presented in this study visually reveal the evolution of focal points in this field in recent years to kindergarten teachers, teaching researchers, and administrators. This helps practitioners transcend the limitations of individual experience, allowing them to examine and plan their own pedagogical reforms and research priorities based on overarching research trends. By doing so, practical innovations can resonate with academic frontiers, avoiding arbitrariness and misdirection.

Providing an Operational Methodology for Early Childhood Education Practice

By analyzing the sustained emergence of keywords such as "Teacher Support" and "Support Strategies," this study provides frontline teachers with specific support strategies and actionable recommendations that can be directly applied to kindergarten educational practices. Through a synthesis of the literature, the research suggests that teachers develop support strategies across five dimensions: environmental design, teacher-child interaction, peer influence, home-kindergarten collaboration, and multiple assessment approaches. Additionally, it recommends designing differentiated guidance plans tailored to various types of area play. These contributions offer teachers a practical methodology for promoting young children's deep learning in actual teaching contexts.

Proposing Systematic and Operational Solutions and Strategic Guidance for Addressing Practical Dilemmas in Promoting Deep Learning within Area Activities

The research not only diagnoses common practical tensions such as "the conflict between predesigned elements and emergent dynamics in activity design," "the balance between consistent and flexible material provision," and "the equilibrium between child autonomy and teacher support in teacher-child interaction," but also, through a comprehensive literature synthesis, distills highly practical and contextually appropriate actionable pathways. These include "planning open-ended activity frameworks," "creating

problem-oriented contextualized environments," "providing differentiated materials and personalized experiential scaffolding," and encouraging "children's preliminary formulation of play plans." In particular, recommendations for designing differentiated support strategies tailored to various types of games—such as exploratory, constructive, and role-playing games—can be directly translated into specific methods within a teacher's instructional toolkit. This significantly enhances teachers' professional capacity to identify learning opportunities and provide effective support within complex and dynamic play contexts.

In summary, this study, through systematic bibliometric and visual analysis, not only delineates the academic landscape of young children's deep learning research from 2018 to 2025 using a data-driven approach, thereby addressing the gap in macro-level quantitative analysis within this field, but also constructs a theoretical framework comprising nine core thematic clusters. It clearly reveals the evolutionary trajectory of research hotspots transitioning from foundational concepts to the deepening of practical strategies. At the practical level, this research provides educators with evidence-based insights into developmental trends and actionable methodological guidance. In particular, it proposes systematic solution pathways and differentiated support strategies targeting the practical dilemmas of promoting deep learning within area activities. Therefore, the findings of this study possess significant theoretical value and practical implications. They offer both a new analytical benchmark and an integrative framework for the academic advancement of the field, as well as scientific foundations and actionable references for enhancing the quality and innovative reform of kindergarten educational practices.

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