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# *Knowledge Graph Visualization and Analysis of Research Hotspots and Trends of Teacher-Child Interactions in Kindergartens in China in the Past Ten Years*

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***Abstract:*** To realize high-quality and connotative development of preschool education in China, focusing on process quality is the key, while improving the level of teacher-child interaction is the key. In order to more accurately provide reference directions for the research on teacher-child interaction, the overall development and trends of teacher-child interaction were systematically analyzed with the help of CiteSpace, a visual analysis software, by taking the literature on teacher-child interaction included in China Knowledge Network from 2014 to 2024 as a sample. The results show that the research literature related to teacher-child interaction has shown an upward trend in quantity in the past decade, but the core group of authors has not yet been formed, and the research institutions mainly focus on higher education institutions and kindergartens, and the hotspots of research mainly focus on the value, quality, current situation and countermeasures of teacher-child interaction. At present, there is still room for progress and deepening of research on teacher-child interaction in terms of research methods, research perspectives and research contents.

In the 1990s, the concept of “teacher-child interaction” was introduced, and many scholars have defined it. Through reviewing the research of related scholars, it is found that teacher-child interaction has a certain promotion effect on young children's learning quality, mental health and other aspects, and this promotion effect is continuous.

In recent years, studies have found that many scholars choose to conduct research from the perspective of a “bystander” and use questionnaires, observation and measurement methods in the research process. This routine approach to research allows for relatively objective results. Looking at the current state of research on teacher-child interaction, much of the research is conducted from an adult perspective, and little is done from a child's perspective. In teacher-child interaction, the teacher-child relationship is not one of subordination to the other, but a mutual process of interaction. Children themselves have the capacity for active construction, which is not governed by “adult” standards. [1] However, in our current research, there are a series of problems such as the lack of subjectivity and passivity in interaction for the young child as a subject [2]. Therefore, in order to fully understand the current situation of teacher-child interaction, it is necessary to fully consider the two subjects of teacher-child interaction, the teacher and the young child, both of which are indispensable [3].

Based on the above, this study wanted to use the CiteSpace visualization tool to sort out the

collected literature on teacher-child interaction research from 2014-2024, in order to understand the current development dynamics and hot issues of the research on teacher-child interaction, so as to be able to better identify the research deficiencies and to promote the development of research in this field.

## 1. Data sources and research methodology

### 1.1 Data sources

The source of data for this study was a literature search from China Knowledge Network (CNN), with the subject term set as “Teacher-Child Interaction”, setting the time period as July 2014 to July 2024, and then starting the search, which eventually yielded 1,702 pieces of literature information. It is then manually screened to eliminate those that do not meet the requirements, including news articles, conference abstracts, and duplicate literature. After the data collection was done, CiteSpace was opened and de-duplicated again, resulting in a total of 1,112 valid samples, and the literature was searched up to July 31, 2024.

### 1.2 Research methodology

In order to more systematically and comprehensively examine what research looks like in the field of teacher-child interaction, this study uses the analysis software CiteSpace Visualization developed by Dr. Chaomei Chen to provide an in-depth exploration from different perspectives. The research status is analyzed in terms of the number of publications, research authors, publishing institutions, and keywords; the step-by-step evolution process, development trend, and cutting-edge hot issues in the field are analyzed through timeline view, emergent words, and clustering.

## 2. Status of research

### 2.1 Analysis of the number of communications

The annual increase or decrease in the publication of literature in a particular field can reflect to some extent the level of researchers' interest in the field [4]. Statistical data of related literature from China Knowledge Network (CNN) showed that the number of articles published on teacher-child interaction showed an overall upward trend in the last ten years from 2014 to 2024.

### 2.2 Knowledge mapping analysis of research institutions

Based on the knowledge map of research organizations drawn by CiteSpace and the corresponding backstage information, two main types of research organizations concerning teacher-child interactions can be summarized. One category is higher education institutions and the other is kindergartens. We can see from the knowledge map of research institutions that the universities and colleges such as Central China Normal University, Northeast Normal University, Sichuan Normal University, Qinghai Normal University, Shandong Normal University, Hebei University and Guangxi Normal University are the main ones. Among them, there are cooperative relationships between institutions such as Northeast Normal University and the College of Teacher Education at Daqing Normal College, the China Collaborative Innovation Center for Quality Testing in Basic Education at Beijing Normal University and the College of Elementary Education at Zhengzhou Normal College. In addition, the existence of different research departments in a research institution that work very closely with each other, such as the Department of Education and the Department of Psychology in

Northeast Normal University, and the College of Education and the Department of Physical Education in Hebei Institute of Science and Technology Teachers' College, it can be seen that the use of these research bases can bring together the research power of teacher-child interactions, and create some kind of cohesion, thus promoting further enhancement of and breakthroughs in the research.

### 2.3 Research author knowledge graph analysis

Combining the knowledge graph of the authors of the paper constructed by CiteSpace and combining the relevant literature, we can see that the researchers are mainly university teachers, master's and doctoral students, and kindergarten teachers. According to Price's theorem, the number of paper releases by the lowest author can be calculated using $M = 0.749 \times \sqrt{Nmax}$, where Nmax denotes the highest number of releases of a paper published during the period [5]. Based on the results of CiteSpace, it can be seen that the first place in terms of the number of publications is the scholar Xiaomei Zhang, who has published 8 articles, which is substituted into the formula to show that M is 2.12. The total number of publications is 3 or more is 5, and the total number of publications is 23, accounting for 2% of the total number of publications, which fails to satisfy the indicator value of "the core group of authors should not be less than 50% of the total number of publications" in Price's Theorem. It is clear from this that a core group of authors in teacher-child interaction research has not yet been formed.

### 2.4 Keyword knowledge map analysis

Since keywords are the core and most refined content in an article, analyzing keywords and frequency can reveal research hotspots. In this paper, 1113 documents are selected as data source, time slice is set to 1, node selects keyword, and then CiteSpace calculation is run to generate the keyword knowledge graph, and it is found that Network: N=412, E=907, that is to say, there are a total of 412 keyword nodes, and there are 907 connections between keywords, which can be seen that the keyword connections between the keywords are relatively close.

High-frequency keywords can reflect the research hotspots of interest to researchers in a certain period of time, and higher centrality indicates that the point is more important in the network [6]. The keywords with frequency ≥ 10 were refined in order to better demonstrate the high-frequency terms. They are "teacher-child interaction", "kindergarten", "early childhood education", "young children", "strategies", "regional activities", "interaction", "role play", "Early Childhood Teachers", "Teacher-Child Relationships", "Middle Childhood", "Preschool Education" "countermeasures", "teachers", "novice teachers", "effective strategies", and summarizing the findings by combining the key words, it was found that Teacher-child interaction research is categorized into five main areas: groups of young children, teacher-child interaction strategies, educational activities, groups of teachers, and quality of interaction.

Teacher-child interaction includes the interaction between the two subjects of children and teachers, and it is the children who are the basis for conducting the research on teacher-child interaction, and we should focus our attention on the children and how they are in the process of interaction; the hot topic of research on strategies is to explore how to optimize teacher-child interactions; the main battleground for teacher-child interactions is in instructional activities, so researchers should focus on how teachers and children interact in various activities; also teachers play a role in the process of teacher-child interaction and are one of the influencing factors on the quality of teacher-child interaction; this is because the role of teacher-child interaction can only be optimized if the quality of interaction is improved.

## 3. Research trends and hot spots

### 3.1 Keyword timeline mapping

The Timeline view of CiteSpace software is utilized to construct a keyword timeline mapping of teacher-child interaction research in order to better describe and present the evolution and time trajectory of the important keywords in each clustering module, present the temporal distribution of and interrelationships between teacher-child interaction research, and identify the progress of teacher-child interaction research. According to the keyword timeline mapping, it can be seen that people have been focusing on the study of teacher-child interaction in various activities since 2014; in the past two years, more attention has been paid to the study of the strategy of teacher-child interaction as well as the role of teacher-child interaction; and teacher-child interaction has always been a hot research issue that people have been concerned about. Between 2014 and 2020, the focus was more on small and middle school children, and since 2020, it has gradually been focused on older children as well.

### 3.2 Keyword clustering mapping

CiteSpace gives two metrics, the clustered module value (referred to as Q-value) and the average profile value (referred to as S-value), based on the network structure and the clarity of the modules to measure the evaluation metrics of the effectiveness of the mapping. Keyword clustering analysis was conducted by exporting relevant literature through CiteSpace, and keyword clustering mapping of domestic teacher-child interaction research from 2014-2024 was obtained, in which Q=0.4992>0.3 and S=0.9264>0.5, which indicates that the clustering structure is significant, and the clustering results are reasonable, with a good degree of credibility, and able to be convincing. There were 34 clusters and 9 were shown in the mapping, which were “#0 Teacher-Child Interaction,” “#1 Kindergarten,” “#2 Early Childhood,” "#2 3 Early Childhood Education“ ”#4 Teacher-Child Relationships“ ”#5 Strategies“ ”#6 Early Childhood Perspectives“ ”#7 Older Classes Young Children“ ”#8 Respect". Among them, “#0 Teacher-child interaction” and “#4 Teacher-child relationship” are related to the content of the study, “#1 Kindergarten”, "#2 Early Childhood “ ”#7 Kindergarten“ is related to the research object of teacher-child interaction, which indirectly indicates that the retrieved literature is consistent with the research topic; ”#3 Early Childhood Education“ ”#5 Strategy “”#6 Early Childhood Perspectives" are related to the methods and perspectives of teacher-child interactions, indicating that they are the focus of the research field of teacher-child interactions.

### 3.3 Keyword emergence mapping

Using the keyword emergence view area in the CiteSpace software, the cutting-edge hotspots and evolutionary trends of current research can be shown more clearly to help researchers better grasp the time span of hotspot keyword evolution and make predictions about its development trend.By detecting keyword emergence in 1113 pieces of literature, the cutting-edge hotspot evolution of the teacher-child interaction research in the period of 2014-2024 can be trends into 3 stages. The first phase was 2014-2015, and the cutting-edge hotspots in this phase were mainly interaction, teacher-child relationships, and respect, indicating that research on the connotations of teacher-child interactions was predominantly conducted within this period. The second stage is 2016-2021, when teachers, ball games, educational suggestions, meanings, and revelations become the focus of the academic community, and in this period began to focus not only on the study of teacher-child interaction itself, but also on the kind of activities in which teacher-child interaction is carried out and how it is carried out. The third stage is 2022-2024, effective strategies, teaching strategies, children's

stance, children's perspective and so on become research hotspots, in which “children's stance” and “children's perspective” are key words with high intensity of emergence, which shows that academics are more and more aware of the importance of the importance of the subject of children.

## 4. Conclusions and outlook of the study

Research on teacher-child interaction has been on the rise year by year, and the content of the research has been gradually enriched. However, judging from the current research, there is still room for further strengthening and deepening.

First, in terms of research institutions and research authors, although the number of publications is increasing year by year, research on teacher-child interactions still remains between small groups, and collaboration between institutions and between authors needs to be improved. Because it is difficult for a single research institution or author to comprehensively cover all areas of research as research progresses, it has become particularly important to strengthen inter-institutional and inter-author collaboration.

Secondly, in terms of the content of the research, it can be found from the existing research that it is more focused on the current situation and what should be done to improve the quality of teacher-child interaction and what measures should be taken. Although the existing research results are relatively rich, most of them stay at the surface level of description, and the research on the nature of teacher-child interaction is still insufficient. At the same time, the coherence and integration between many research results need to be further strengthened, and it has not been possible to construct a relatively comprehensive and in-depth corresponding framework of teacher-child interaction.

Thirdly, in terms of research methodology, many researchers will adopt quantitative research methods, while qualitative research is relatively rare. According to the collected data, it is not difficult to find that the researchers more from the current situation to explore the teacher-child interaction, mostly through the questionnaire method, interview method or scale and other forms of teacher-child interaction research. Therefore, subsequent studies can add qualitative research to make up for the shortcomings of the study and promote the development of research in this field in a more comprehensive, in-depth and detailed direction.

Fourth, many studies focus only on certain or a specific time period or a specific fragment of interaction, often ignoring a dynamic development process of teacher-child interaction throughout the preschool stage as well as the long-term cumulative effects. It also fails to track in-depth how teacher-child interaction patterns change over time, with the growth of young children and the progress of educational and teaching activities, making it difficult to comprehensively reveal the continuing role and influence of teacher-child interaction on young children's development, which is not conducive to planning and optimizing the practice of teacher-child interaction in the long term. Also, previous research has paid little attention to how kindergarten teachers evaluate the quality of teacher-child interactions.

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