

A Comparative Study on Rural Teachers' Professional Development Research between China and Foreign Countries: A Visual Analysis through Citespace Software

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Abstract: In recent years, teachers' professional development has become the core of rural education reform and development policies all over the world. Based on the two authoritative databases, China National Knowledge Infrastructure (CNKI) and Web of Science (WOS), this paper collects Chinese and English literature on rural teachers' professional development, and uses CiteSpace 6.1. R6 software to draw the knowledge graph about keywords in the literature, aiming to comprehensively grasp the overall profile, research hotspots and future trends of rural teachers' professional development. Besides, through in-depth comparative analysis, this paper finds that the research between China and foreign countries shows similarities and differences in research topics, perspectives, and methods. Finally, this paper aims to provide valuable reference and inspiration for the theoretical research and practical exploration of rural teachers' professional development, and thus promote the high-quality and sustainable development of the rural teaching force.

Keywords: Rural Teachers; Professional Development; CiteSpace Analysis; Visual Analysis; Comparative Study

1. Introduction

Against the backdrop of global economic and educational development, the 2030 Agenda for Sustainable Development adopted by the United Nations in September 2015 provides important guidance for educational reform and development in countries around the world. Among them, the fourth goal (SDG4), "ensuring inclusive and equitable quality education and lifelong learning opportunities for all", not only highlights the dual pursuit of educational equity and quality, but also puts forward higher requirements for teachers' quality^[1]. In this context, many countries are moving towards the goal of Educational for All (EFA), but it is difficult to achieve in rural or remote areas of developing countries^[2]. Therefore, the quality of rural teachers has become one of the key issues in international education research. In China, the construction of rural teacher teams has become an important part of promoting the sustainable development of education. In 2020, the Ministry of Education and six other departments issued the Opinions on Strengthening the Construction of Rural Teacher Teams in the New Era^[3], which clearly stated that it is necessary to strengthen the construction of rural professional talent teams and provide strong talent support for rural revitalization.

However, in reality, rural teachers often confront a myriad of issues, including scarcity of educational resources, limited professional development opportunities, and heavy workload, which makes it difficult for them to effectively improve their professional quality and teaching ability, thereby affecting the success of students^[4]. Therefore, it is particularly urgent and of great significance for academic circles to conduct in-depth research on the professional development of rural teachers.

When discussing the definition of rural teachers' professional development, the academic community has not yet reached a universally recognized, unified and clear definition. Scholars often indirectly explain the professional growth of rural teachers by explaining the broader concept of "teachers' professional development" or "professional development". Perry^[5] claimed that teachers' professional development includes the enhancement of teachers' sense of teaching efficacy, the broadening of knowledge, the improvement of technology, and their in-depth reflection on their educational and

teaching behaviors.

At present, some scholars have begun to systematically analyze the existing literature to fully grasp the current situation, frontiers and future trends of rural teachers' professional development research^[6]. However, existing research mainly focuses on the quantitative analysis of Chinese literature, with a relative scarcity of analysis of foreign-related literature. Foreign scholars are more concerned about the research overview of rural teachers, professional development, or teachers' professional development, making it challenging to locate comprehensive reviews or retrospective studies that specifically on the professional development of rural teachers. Therefore, this paper accurately selects the latest research data in China and foreign countries, and conducts a comparative analysis of the literature on the professional development of rural teachers from the aspects of research overview and research hotspots, aiming to provide scholars in this field with a clear understanding of the developmental trajectories, as well as the similarities and differences in research on rural teachers' professional development. This research is mainly guided by the following two questions:

1) What is the current status of research on rural teachers' professional development in China and foreign countries?

2) What are the main similarities and differences between Chinese and foreign studies on rural teachers' professional development?

2. Research method and procedures

This paper uses CiteSpace 6.1. R6 visualization software to conduct knowledge graph analysis on the selected literature. CiteSpace is an information visualization software developed by a team led by Professor Chaomei Chen of Drexel University in the United States. Most scholars explain the current state of their research field and predict the frontiers by interpreting the visualization maps produced by the software.

2.1. Data collection

The data on Chinese research in this study were obtained from the China National Knowledge Infrastructure (CNKI) database, and the data on international research were obtained from the Web of Science Core Collection, both of which are well-known comprehensive databases containing a large number of scholarly publications. To ensure the focus of our investigation, we designed a targeted search strategy, which initially generated 439 and 326 articles respectively. For Chinese research, we conducted an advanced search on the CNKI database and determined that the search term was "rural teachers' professional development", while for international research, we set the search formula as "Topic = rural teachers and professional development", which were set as the starting point for our analysis.

2.2. Data screening

This involved a manual review of the title, abstract, and keywords of each article, aiming to identify those that explicitly addressed the topic of "rural teachers' professional development". Articles that did not meet this specific criterion, such as studies on principal leadership, were systematically excluded from further consideration despite being initially included based on the search query. This meticulous selection process resulted in a refined data set of 436 and 246 articles, respectively, which were suitable for inclusion in our study as primary data sources.

2.3. Data analysis

This study uses CiteSpace 6.1. R6 version software as the core analysis tool to systematically explore the current status of research on rural teachers' professional development in China and foreign countries. First, the literature strictly collected from CNKI and Web of Science are exported to Refworks and plain text format respectively, and then imported into CiteSpace software. In view of the difference in the starting year of Chinese (2007) and foreign (1999) literature, this study set the corresponding time span: Chinese literature is from September 2007 to June 2024, and foreign literature is from January 1999 to June 2024. To ensure the accuracy of the analysis, the time slice is set to 1 year. At the same time, the k value under the G-index parameter (set to 25 for Chinese literature and 10 for foreign literature) and the Top N value (set to 50) are adjusted to focus on high-impact literature.

The following is a detailed review of the research process. First, an annual publication analysis was conducted to grasp the trends in research intensity within the field. Then, the CiteSpace software is used to conduct keyword co-occurrence and cluster analysis on the effective literature, aiming to reveal the current status, hot spots and potential trends of the professional development of rural teachers in China and foreign countries from multiple dimensions. The co-occurrence analysis refers to the construction of a co-occurrence matrix by counting the co-occurrence frequency of keywords in the same document, so as to intuitively display the internal connections between research topics^[7]. Cluster analysis divides research into different clusters based on keyword similarity, revealing the internal structure and evolution path of research hotspots^[8].

However, it should be pointed out that although the CiteSpace software can provide macro-level visual analysis, it is difficult to delve into the differences in the content of the literature and the unique insights in specific contexts because of its automated processing. Therefore, on the basis of quantitative analysis, this study particularly emphasizes the importance of manual intensive reading and comparative analysis. Based on the preliminary review of the current status of research on rural teachers' professional development, this paper attempts to deeply read the core literature in the field of rural teachers' professional development in China and foreign countries, and deeply dig deep into their similarities and differences from the dimensions of research overview, research hotspots and themes, and explore the underlying reasons behind them. Ultimately, this study provides valuable inspiration for future research on rural teachers' professional development, thereby promoting the deep integration of the global vision and localized practice in this field.

3. Results and analysis

3.1. Overview of Research on Rural Teachers' Professional Development in China and Foreign Countries

As shown in Figure 1, compared with China, international research on rural teachers' professional development started slightly earlier. By analyzing the number of related articles and the increase in literature, the professional development of rural teachers in China can be divided into three stages, while international research can be divided into two stages.

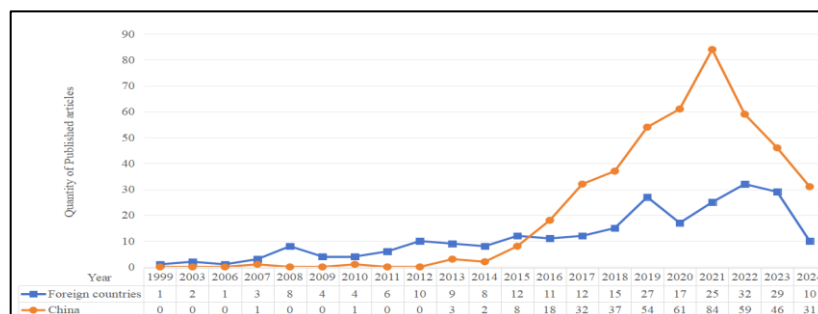


Figure 1: Annual distribution of literature on rural teachers' professional development in China and foreign countries.

First of all, from 2007 to 2014 in China, the number of research papers on the professional development of rural teachers was no more than 5 per year, which remained stable. However, from 2015 to 2021, the number of publications on this research has shown an obvious and sharp increase. However, compared with 2021, the research results published from 2022 to June 2024 have dropped significantly. Compared with Chinese research, from 1999 to 2018, the number of papers involving the professional development of rural teachers in international research showed a gradual upward trend, but the number of papers published each year did not exceed 15.

Since 2018, the number of relevant papers has shown a significant increase compared with the previous stage (the number of papers published per year has reached or exceeded 15), which indicates that the research on the professional development of rural teachers has entered a stage of rapid development, showing a vigorous development trend. However, it is worth noting that there has been a short-term downward trend at time nodes such as 2020, 2023 and 2024. In addition, since this study limits the search time for literature to June 2024, it is predicted that the final number of publications in China and foreign countries in 2024 will exceed 40 and 20 articles respectively. In summary, the research topic of rural teachers' professional development in China and foreign countries still has high research

value and potential in the context of the current era.

3.2. Research Hotspots and Topics on Rural Teachers' Professional Development in China and Foreign Countries

Keywords can quickly and accurately reflect the research theme and focus of a paper. By using CiteSpace software to perform keyword co-occurrence analysis, we obtained the keyword co-word network knowledge map of the research on the professional development of rural teachers in China and foreign countries, as shown in Figure 2. By comparing the keyword co-occurrence maps of the research on the professional development of rural teachers in China and foreign countries, it is not difficult to find that professional development, rural teachers, rural education, challenge, and strategy are common research hotspots for the professional development of rural teachers in China and foreign countries.

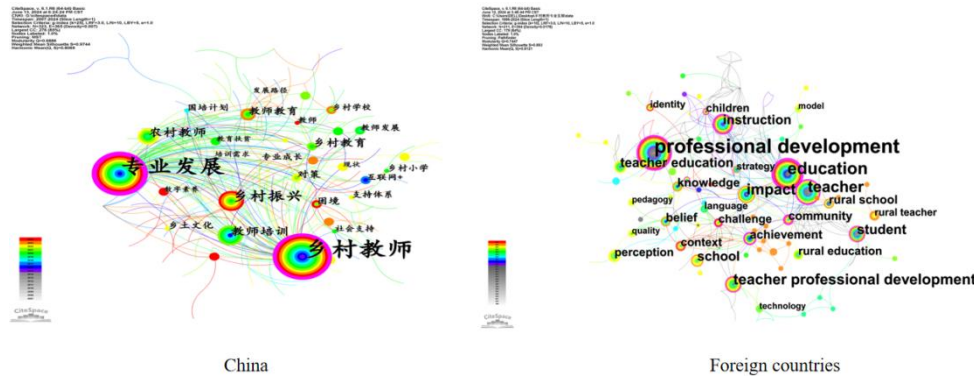


Figure 2: Co-occurrence atlas of rural teachers' professional development research in China and foreign countries.

In addition, in order to help scholars further understand the hot topics in the field of rural teacher professional development research in China and foreign countries, after carefully considering the word frequency of keywords, the top 15 high-frequency keywords in this field in China and foreign countries is listed, see Table 1. As shown in Table 1, there are certain differences and consensus in the field of rural teacher professional development research in China and foreign countries. In the international research, keywords such as students, community, identity, perception, and belief occupy a prominent position, reflecting the current hot spots and trends in international research. In Chinese research, keywords such as rural revitalization, education poverty alleviation, national training programs, teacher training, and Internet plus appear frequently, highlighting the importance and attention of these topics in the field of professional development of rural teachers in China.

Table 1: Top 15 high-frequency keywords of rural teachers' professional development research in China and foreign countries.

China			Foreign countries		
Rank	Keywords	Frequency	Rank	Keywords	Frequency
1	rural teacher	230	1	professional development	76
2	professional development	158	2	education	38
3	rural revitalization	28	3	teacher	29
4	rural teacher	15	4	impact	25
5	teacher training	15	5	teacher professional development	24
6	rural education	11	6	student	17
7	teacher education	9	7	instruction	16
8	strategies	8	8	school	16
9	rural culture	7	9	teacher education	16
10	difficulties	7	10	community	12
11	rural primary school	6	11	achievement	12
12	professional growth	6	12	belief	12
13	national training program	6	13	knowledge	11
14	support system	6	14	rural school	11
15	Internet plus	6	15	perception	10

After completing the keyword co-occurrence map, using the automatic clustering function of CiteSpace software, LLR algorithm was selected to cluster and analyze the keywords of rural teachers' professional development research in China and foreign countries, and K (keyword) was used to extract the clustering label. Finally, a keyword clustering map of Chinese and foreign rural teachers' professional development research was obtained, as shown in Figure 3. Based on the clarity of network structure and clustering, CiteSpace provides two metrics, the module value (Q value) and the average profile value (S value), which can be used as a basis for judging the effectiveness of the mapping. Generally speaking, the Q value is in the interval of [0, 1], and $Q > 0.3$ means that the delineation of the community structure is significant; when the S value is 0.7, the clustering is highly efficient and convincing, and if it is above 0.5, the clustering is generally considered reasonable^[9]. According to Figure 3, the clustering results for international studies exhibit a Q-value of 0.7447, which is greater than 0.3, and an S-value of 0.893, exceeding 0.7. Similarly, the clustering results for Chinese studies show a Q-value of 0.6886, also greater than 0.3, and an S-value of 0.9744, exceeding 0.7. These findings indicate that both clusters are significantly credible.

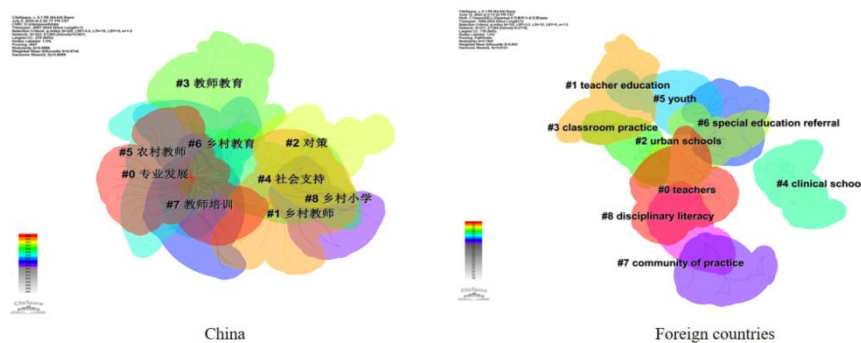


Figure 3: Cluster atlas of rural teachers' professional development research in China and foreign countries.

Table 2: The cluster information of rural teachers' professional development research in China and foreign countries.

Cluster ID	China			Foreign countries		
	Size	Silhouette	Keywords	Size	Silhouette	Keywords
0	66	0.999	Professional development; Teachers' professional development; Online training;	29	0.777	teachers; two-way immersion; teacher qualifications;
1	55	0.995	professional development; rural teachers; teachers' professional development;	27	0.869	teacher education; professional development; professional learning;
2	23	0.97	countermeasures; rural revitalization; current situation;	22	0.818	urban schools; rural education; China;
3	17	0.927	teacher education; teacher profession; rural areas;	21	0.974	classroom practice; instruction; implementation;
4	17	0.898	social support; cultural existence; alienation;	20	0.994	clinical school; effective workforce strategy; intern choice;
5	17	0.966	rural teachers; rural education; involution;	19	0.907	youth; individualized instruction; prevention;
6	17	0.98	rural education; rural culture; endogenous motivation;	16	0.93	special education referral; impact; belief;
7	16	0.954	teacher training; national training program; training needs;	14	0.975	community of practice; grounded theory; life orientation;
8	14	0.921	rural primary schools; support system; ethnic regions;	10	0.888	disciplinary literacy; study groups; content area reading;

According to Figure 3, the research on rural teachers' professional development in China and foreign

countries has formed 9 closely connected keyword clusters (ranked 0-8), among which “teacher education” (ranked 3 in China and ranked 1 in foreign countries) was the most important keyword cluster for rural teachers’ professional development in China and foreign countries. After sorting out the cluster information, Excel was used to sort out the specific information of the clusters of research on the professional development of rural teachers in China and foreign countries according to the cluster names, see Table 2.

After studying relevant literature and combining clustering information, we found that foreign research on rural teachers’ professional development mainly focuses on the following three categories. First, the specific content of rural teachers’ professional development, involving the following three clusters, namely #0 teachers, #1 teacher education, #8 disciplinary literacy. Second, the current situation or challenges of rural teachers’ professional development, including #2 urban schools, #5 youth, #6 special education referral. Third, the practical path of rural teachers’ professional development, including #3 classroom practice, #4 clinical school, #7 community of practice.

The research hotspots of Chinese rural teachers’ professional development research can be summarized into the following aspects. First, the background of rural teachers’ professional development, including #0 professional development, #1 rural teachers, #6 rural education. Second, the current situation and dilemma of rural teachers’ professional development, involving #5 rural teachers, #7 teacher training, #8 rural primary schools. Third, the methods and strategies of rural teachers’ professional development, including #2 countermeasures, #3 teacher education, #4 social support, #7 teacher training. After comparative analysis, the professional development of rural teachers in China and foreign countries has shown significant similarities and differences in research themes. Generally speaking, Chinese and foreign studies have conducted in-depth discussions on the current situation, challenges and practical paths of rural teachers’ professional development.

Among them, in terms of exploring the current situation and challenges of rural teachers’ professional development, the research focus of foreign countries is broader than that of Chinese ones. Specifically, Chinese research mainly focuses on the development of teachers themselves, and pays more attention to the problems faced by rural teachers in the process of professional development. In particular, in recent years, the involution of rural teachers has become a major dilemma for the professional development of rural teachers^[10]. On this basis, foreign research has further considered the behavioral intervention of adolescents in rural areas^[11] and the learning needs of special education groups^[12], which has brought new challenges to the professional development of rural teachers.

When it comes to the practical path of rural teachers’ professional development, Chinese and foreign studies also show certain similarities and differences. Both Chinese and foreign studies have shown that personal self-reflection of teachers is an important way to promote the professional development of rural teachers^{[13][14]}. The difference is that Chinese studies mostly start from their own national policies to explore the practical path of rural teachers’ professional development, such as developing local cultural courses^[15], while foreign studies reflect the mutual reference of rural teachers’ professional development paths at the national level or create learning communities based on regions or school.

In addition, there are significant differences in research topics between the two. First, foreign scholars focused on the theoretical content of the professional development of rural teachers. After reviewing existing teachers’ professional development models in other countries, Kriek and Grayson summarized their common characteristics and suggested that rural teachers’ professional development should mainly consider content knowledge, teaching approaches and professional attitudes^[16]. In addition, with the widespread application of digital technology in the teaching field, digital literacy has gradually become an important indicator to measure the professional development of rural teachers^[17]. To sum up, although there is no unified definition of the components of rural teachers’ professional development in foreign countries, most studies involve the following three aspects. First, the professional knowledge, skills and attitudes required by rural teachers in educational practice. The second is the teaching ability of rural teachers in specific subject areas. The third is the digital literacy of rural teachers in the digital era.

Chinese research focuses on the professional development of rural teachers under policy guidance. In 2015, Rural Teacher Support Plan (2015-2020)^[18] proposed to improve the ability and quality of rural teachers through various forms such as online training and school-based training. In 2018, the Action Plan for the Revitalization of Teacher Education (2018-2022)^[19] was issued to emphasize the importance of carrying out high-quality rural teachers’ training to promote the professional development of rural teachers. In 2022, Digital Literacy of Teachers issued by the Ministry of Education^[20] stipulated the specific requirements and content of teachers’ digital literacy. Against this background, the research topics of rural teachers’ professional development in China are becoming increasingly diverse, covering

online training, national training programs, digital literacy and other aspects.

There are also certain differences in research perspectives and methods in China and foreign countries. After defining the basic components of rural teachers' professional development, foreign scholars begin to use a variety of research methods such as quantitative^[21], qualitative^[22] and mixed research methods^[23] to conduct in-depth investigations and analyses on the current status of professional development of rural teachers (including pre-service teachers) in a specific region. Chinese research is mainly based on theoretical exploration and macro measures. Most scholars use questionnaires to investigate the level of professional development of rural teachers in a certain region^[24], and there are a few interview studies^[25]. However, the use of other qualitative research methods and mixed research methods is still insufficient, which may limit the ability of Chinese research to reveal the deep-seated problems of rural teachers' professional development and make it difficult to fully reveal the internal logic and driving mechanism of rural teachers' professional development.

In terms of research perspective, most of the research on the professional development of rural teachers in China focuses on a single educational perspective, that is, focusing on exploring the issue of professional development of rural teachers in the realistic context of rural education or teacher education^[26]. In view of the breadth of foreign research topics, in addition to pure teacher education, foreign scholars also pay special attention to mental health^[27], professional identity^[28], etc., which reflect the disciplinary perspectives of psychology and anthropology.

4. Discussions and implications

4.1. Discussions of the study

All the findings in this study come from the above analysis and the results of previous studies. First, in terms of research progress, research on rural teachers' professional development in China and foreign countries has generally shown an upward trend. Especially after 2018, research related to rural teachers' professional development in China and foreign countries has entered a period of rapid development, which is consistent with the findings of Chinese scholars such as Luo^[29]. The accelerated development of this trend is likely to be closely linked to a series of important policy documents issued in China in 2018. Specifically, Action Plan for the Revitalization of Teacher Education (2018-2022)^[30] issued in 2018 clearly emphasized the key role of improving the quality and scale of rural teacher teams in realizing the strategy of rural revitalization through education, and provided strong policy support for the research and practice of rural teachers' professional development.

The second finding of this study is that the common research hotspots of rural teachers' professional development in China and foreign countries are the current situation, challenges and practical paths of rural teachers' professional development. Several potential factors can explain this convergence of research interests. First, improving the quality of rural education is a globally recognized cornerstone of sustainable development, and to a certain extent, the level of professional development of rural teachers determines the quality of rural education^[31], so it is necessary to conduct a more careful review of the level of rural teachers' professional development. Second, the unique challenges faced by rural teachers, including physical distance, psychological isolation, and limited opportunities of professional development, have forced scholars to explore effective rural teacher professional development strategies^[32]. Finally, Chinese and foreign scholars recognize that teachers' professional development has an important impact on students' achievement^[33], especially in under-served areas, which has promoted a surge in interest in understanding and addressing the specific development needs of rural teachers.

Besides, foreign research on the professional development of rural teachers has a broader perspective, focusing not only on the theoretical framework of rural teachers' professional development, but also on specific problems and conducting practical exploration. In contrast, similar to the conclusion of Zhou et al.^[34], this paper also found that Chinese research is more influenced by policy orientation, focusing on analyzing the impact of the policy environment on the professional development of rural teachers, and how to promote the practice and innovation of rural teachers' professional development under the policy framework. This finding further confirms that in the context of Chinese profound historical origin of emphasizing agriculture, rural teachers are the key force for the country to promote educational modernization. In addition, it is worth noting that with the advent of the digital age, Chinese and foreign research has paid unprecedented attention to the cultivation and improvement of rural teachers' digital literacy. This shows that Chinese and foreign scholars generally recognize that rural teachers' digital literacy is not only a key sign of the modernization of their personal professional capabilities, but also an

important way to promote the modernization of rural education.

The third finding of this study is the differences in research perspectives and research methods on the professional development of rural teachers in China and foreign countries. First, compared with Chinese research, foreign research perspectives are more diverse. Second, Chinese research tends to use questionnaires to provide quantitative support for policy formulation and status assessment, while foreign research methods are more diversified. This difference also reflects the differences in academic environment, research traditions and disciplinary development levels in China and foreign countries. In summary, foreign research in the field of rural teachers' professional development started earlier, and formed a relatively mature research paradigm and method system. Chinese research is in a stage of rapid development. Although significant progress has been made in recent years, there is still room for improvement in terms of expansion of research perspectives and innovation of research methods.

4.2. Implications of the study

The significance of this study lies in the following two aspects. First, when comparing the literature on the professional development of rural teachers in China and foreign countries, a method combining knowledge graph and literature analysis is used to conduct a comprehensive review, breaking through the limitations of traditional literature review. Second, the localized characteristics of the professional development of rural teachers are clearly understood, as well as the common challenges and opportunities faced by the professional development of rural teachers in a global context.

In general, Chinese and foreign scholars should strengthen the dual research paradigm of giving equal weight to theory and practice. First, while clarifying the theoretical basis of rural teachers' professional development and constructing its constituent elements, it is also necessary to closely combine policy orientation with practical problems, and form a horizontal and vertical linkage mechanism in which multiple subjects such as colleges and universities, middle schools, and teachers participate together, and the pre-service and post-service training systems are connected. Second, China should promote the in-depth development of research on rural teachers' professional development by strengthening international exchanges and cooperation, introducing diversified research perspectives and methods. Third, China should also focus on localized practical exploration, combine the actual situation and special needs of rural education in China, and try to build a rural teachers' professional development system with distinct rural characteristics and closely in line with the actual needs of rural education. Finally, Chinese and foreign research should also actively explore the improvement path suitable for rural teachers' digital literacy and the construction strategy of digital education paradigm, so as to help rural teachers better adapt to the educational changes in the digital age and meet the new requirements of professional development.

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