

Analysis of the Current Situation of TPACK Research for Primary School Teachers in China

-- Based on Literature Research

Qianqian Wei^{1,*}, Indang Ariati Binti Ariffin², Jacqueline Tham³

¹Normal college, Sanmenxia Vocational and Technical College, Sanmenxia City, 472000, China

²Graduate School of Management, Management and Science University, University Drive Off Persiaran Olahraga, Seksyen 13,40100 Shah Alam, Selangor, Malaysia

³Graduate School of Management, Management and Science University, University Drive Off Persiaran Olahraga, Seksyen 13,40100 Shah Alam, Selangor, Malaysia

* Corresponding author

Abstract: TPACK (Technological Pedagogical And Content Knowledge) is a form of knowledge that involves the interaction and integration of subject content, teaching methods, and technology in education. It represents a novel knowledge framework essential for teachers in the information age. The TPACK framework necessitates a deep understanding of each facet of knowledge to effectively integrate technology, teaching methods, and subject content for impactful instruction. This study employs literature research methodology and CiteSpace software to comprehensively identify and visually analyze the research landscape of TPACK among primary school teachers in China. It explores the distribution patterns, research hotspots, knowledge base, transformations, and emerging trends within TPACK research. The findings reveal that literature on TPACK studies has been published in CSSCI journals since 2011, illustrating the increasing attention towards TPACK research. Initially, the research focuses on the entire group of primary school teachers and subsequently narrows down to rural primary school teachers, further segmented by disciplines. Researchers primarily investigate the current status, influencing factors, and strategies related to professional development of primary school teachers. Domestically, collaborative research groups primarily concentrate in key normal universities, often encompassing cooperation between different departments within the same institution, while cross-institutional collaboration remains limited. Furthermore, intercollegiate cooperation is sporadic, with minimal established collaborative relationships.

Keywords: TPACK, Primary school teachers, Literature research.

1. Introduction

The professional competence of teachers is crucial to the development of national basic education and the cultivation of talents, thus highlighting the significance of teachers' professional development, which is highly valued by the government [7]. TPACK (Technological Pedagogical And Content Knowledge) represents a knowledge framework where subject content, teaching methods, and technology interact and are integrated into subject content teaching. It is an emerging knowledge paradigm that teachers in the information age should possess. As TPACK research and practice continue to advance, educators increasingly recognize its importance, leading to the publication and dissemination of related research findings and guidance documents.

Currently, what is the status of primary school teacher development in China? Previous studies primarily relied on individual subjective experiences and qualitative methods to summarize literature, with limited utilization of comprehensive analysis through scientific measurement methods [9]. Traditional research approaches have suffered from a lack of sufficient literature coverage and discrepancies stemming from researchers' subjective judgments and perspectives [5]. To address these limitations, this paper employs literature research methodology and utilizes CiteSpace software to examine and visually analyze the TPACK research field pertaining to primary school teachers

in China. Through this comprehensive analysis, we aim to uncover the distribution characteristics, research hotspots, knowledge base, transformations, and emerging trends within TPACK research.

2. TPACK Concept

TPACK refers to a specific and high-value knowledge type essential for teachers to effectively integrate technology in the 21st century. In addition to comprehending the subject content they are teaching, teachers must also select and develop appropriate teaching strategies to cater to learners' diverse learning needs [3].

The TPACK framework necessitates teachers to possess a comprehensive understanding of each facet of knowledge to organically integrate technology, teaching methods, and subject content for impactful instruction [4]. TPACK represents an emerging knowledge paradigm that extends beyond mere combinations of subject content knowledge, teaching method knowledge, and technical knowledge. Instead, it is rooted in a specific vein and functions through dynamic interactions between subject content knowledge, teaching method knowledge, and technical knowledge.

3. Research Method

3.1. Data Source

The data for this study was obtained from the CNKI Chinese database, specifically by searching for literature

using the keyword “TPACK”. The selected source types are core journals and CSSCI journals, and the retrieval period covers from 2011 to August 2023. A total of 127 records were retrieved. After a preliminary screening, 102 valid articles were obtained by removing duplicate publications and those irrelevant to the topic. These 102 articles were then imported into CiteSpace software for knowledge map analysis.

3.2. Research Process

The sample data was acquired from CNKI and converted into the appropriate format using CiteSpace software, which was then placed in the output folder. Data processing was conducted within CiteSpace to visually analyze the core authors, institutions, and keywords present in the literature, thereby obtaining basic information about the research. Keywords and co-citation of literature were employed to extract prominent research keywords. By utilizing the time series of emerging keywords, the evolution process of

research topics and the main content of the research frontier in the field of TPACK were identified. Lastly, the research findings were discussed and analyzed, focusing on the hotspots and development trends of TPACK.

4. An Analysis of the Current State of TPACK Research for Primary School Teachers

4.1. Analysis of Annual Publication Volume

By conducting statistical analysis on the annual publication volume of the literature sample, we can gain insights into the scale and attention given to domestic TPACK research over time. In this study, a total of 102 retrieved documents were analyzed, and the annual trends are depicted using line charts (Figure 1). The X-axis represents the year, while the Y-axis represents the number of articles published.

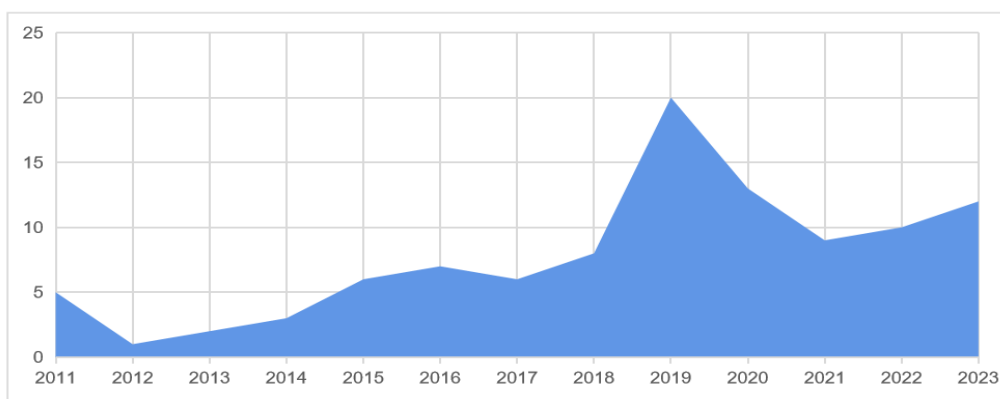


Figure 1. Trends in the number of papers published

It can be seen that the literature on the study of TPACK has appeared in CSSCI journals since 2011. From 2012 to 2013, there were not many high-quality papers related to TPACK, and the number of papers published each year never exceeded three, indicating that the research on TPACK in China was still in its infancy during this period.

Since 2014, the number of articles published has increased rapidly, reaching a peak of 20 articles in 2019. The annual number of articles published from 2014 to 2018 fluctuated slightly, but the average was basically stable at more than 15 articles. As can be seen from the line chart, the research in the field of TPACK is receiving more and more attention.

4.2. Keyword Analysis

The keywords for TPACK research were extracted using CiteSpace software, utilizing “keyword” as the network node. The time span was set from August 2011 to 2023, with each year acting as a time slice. The top N=50 keywords were selected, and the Pathfinder cutting method was applied, while the remaining parameters were left at default settings. This analysis resulted in a keyword co-occurrence map, providing insights into the research hotspots within this field (Figure 2).

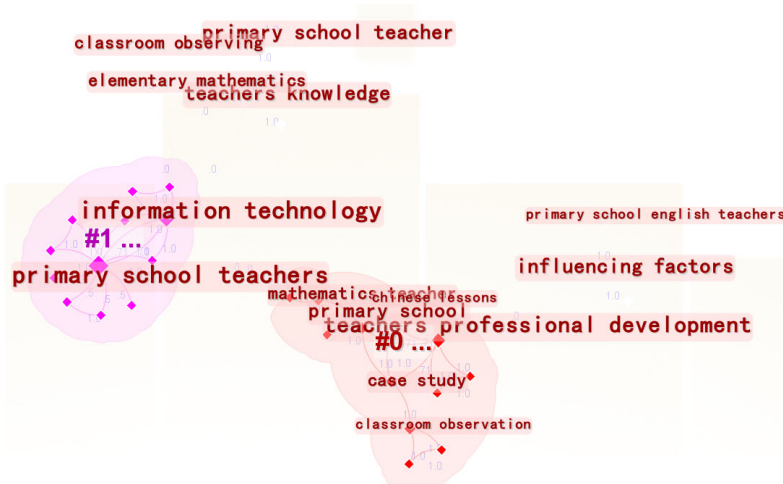


Figure 2. Keywords co-occurrence map

The keyword co-occurrence map reveals the presence of eight prominent keywords within the 102 documents analyzed. Among these, “primary school teacher” appears most frequently in the literature associated with TPACK research, followed by “information technology”. In summary, the field of TPACK is primarily categorized into fundamental research on TPACK, teacher professional development,

practical research on TPACK, and other related areas.

Keywords serve as condensed representations of the core ideas and main content of an article, thereby providing a direct reflection of its essential themes. Figure 3 illustrates the clustering and analysis of high-frequency keywords found within the 102 retrieved articles, resulting in the formation of eight cluster tags.

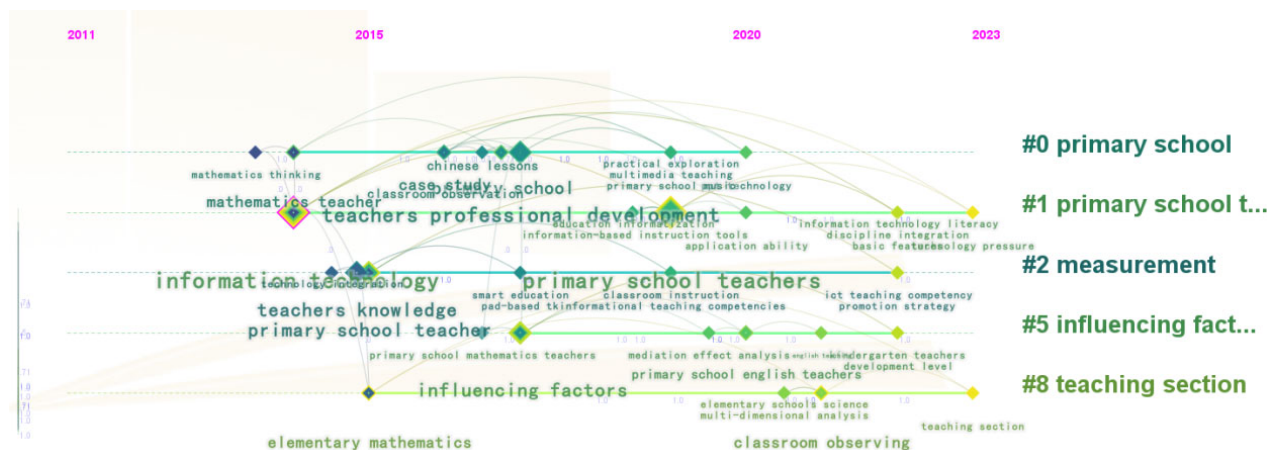


Figure 3. Keyword clustering timeline view

Initially, the research focused on the entire group of primary school teachers and later shifted its attention to rural primary school teachers. Subsequently, it became more specialized, delving into specific disciplines and focusing on the professional development of teachers within those disciplines. The researchers primarily examined the current situation, influencing factors, and strategies for the professional development of primary school teachers.

4.3. Analysis of Research Institutions

To gain insight into the research landscape of TPACK among primary school teachers in China, an analysis of research institutions with over 10 papers was conducted. The findings reveal that domestic research collaborations primarily involve key normal universities, with most collaborations occurring between different departments within the same institution. Cross-institutional collaboration is relatively scarce. Moreover, cooperation between colleges and universities is also fragmented, with limited collaborative relationships established.

5. Research Insights

5.1. Enhancing Teaching Practice Integration Skills

TPACK, as a highly contextualized practical knowledge, has been successfully applied and developed in educational practices worldwide, demonstrating its adaptability to diverse contexts. Teaching with integrated technology lacks a universal framework that can be universally applied to any specific teaching situation[6]. In other words, no teacher training can provide a fixed technical teaching solution applicable to every teacher and course. Given the complexity of TPACK and the demanding schedules of primary school teachers, it is recommended that schools and teacher training departments offer flexible design scaffolding to assist teachers in developing and practicing TPACK within the curriculum.

5.2. Strengthening Self-Organized Professional Development for Teachers

Previous studies predominantly address certain aspects of teachers’ professional development from the perspective of traditional models, such as standard-based and school-based approaches. However, an effective model for teacher professional development remains elusive. Future research should recognize that teachers possess the subjective initiative for self-development, and their professional growth should be seen as a conscious and spontaneous organizational behavior rather than passive dependency on external factors[1]. This calls for fostering self-organized professional development among teachers, wherein teachers’ intrinsic motivation and enthusiasm drive their professional growth and transform existing circumstances.

5.3. Emphasizing Simultaneous Training of TPACK Concept and Technology for Teachers

Teachers acknowledge the importance of information technology in education but may lack an understanding of the complexity and versatility of TPACK[2]. They often focus on hardware resource construction and use information technology solely for organizing and presenting knowledge content, disregarding the development of their own “software” resources. To address this, a new mode of teacher training is warranted—one that rectifies misconceptions about educational informatization, deepens teachers’ understanding of the integration of information technology into subject teaching, and emphasizes effective incorporation of information technology in teaching. This approach ensures a qualitative improvement in the integration of information technology and subject teaching.

5.4. Cultivating Integration and Reflective Abilities for Teachers

To enhance primary school teachers’ TPACK proficiency,

it is crucial to cultivate their reflective awareness, prioritize the accumulation of educational experiences, and foster a habit of self-evaluation in educational and teaching practices [8]. Development in TPACK proficiency requires continuous, objective, genuine, and accurate self-assessment in teaching contexts. Teachers must engage in repeated self-diagnosis and evaluation during their teaching practice to genuinely improve their TPACK proficiency. Additionally, cultivating reflective awareness and self-evaluation habits necessitates the use of scientific and effective evaluation tools. A comprehensive understanding of one's current TPACK proficiency, along with expressing and recording reflective insights, conclusions, and problem-solving strategies in a detailed and coherent manner, can guide, adjust, and rectify teaching behaviors and practices effectively.

6. Conclusions

The literature on TPACK has gained increasing attention since its emergence in CSSCI journals in 2011. From 2014 to 2018, the number of published articles remained relatively stable at around 15 or more per year. This signifies the growing interest in TPACK research. Initially, the focus was on primary school teachers as a whole, and later it shifted to rural primary school teachers. Subsequently, the research began to delve into specific disciplines and the professional development of teachers within those disciplines. The content of teachers' professional development has been explored extensively, covering aspects such as the current situation, influencing factors, and strategies. Collaborative research groups in China primarily consist of key normal universities, with most collaborations occurring among different departments within the same institution. Inter-institutional cooperation is limited, and there are few collaborative relationships formed between colleges and universities. Encouraging teachers to form teaching communities and engaging in teaching activities guided by TPACK is essential to bridge the gap between theoretical knowledge and practical application. Moreover, it is crucial to strengthen primary

school teachers' awareness and capacity for self-reflection.

References

- [1] Chen, J. (2016). TPACK Structure of Physics Teachers and Its Development. *Educational Exploration*, 2016(3), 5.
- [2] Hao, Q., Liu, Y., & Hua, W. (2016). Investigation on the current situation of primary school teachers' TPACK—Taking Tianjin Binhai New Area Primary School as an example. *Basic Education*, 13(5), 10.
- [3] Li, H. (2013). Research on science teaching in primary schools based on the framework of TPACK—Taking the design and application of the course “Plants and Energy” as an example. *China Audio-Visual Education*, 2013(11), 6.
- [4] Lin, X., Hu, Q., & Liang, Z. (2018). Research on the Optimization of STEM Education Based on TPACK. *Audio-Visual Education in China*, (9), 24-30.
- [5] Lou, P., Liu, C., & Chang, S. (2021). Research on the effective development of teachers' TPACK in online training and collaborative interaction. *Primary and Secondary School Teacher Training*, 2021(004), 23-28.
- [6] Shi, X., & Zhao, C. (2018). Study on the strategy of improving the IT application ability of primary and secondary school teachers based on TPACK. *Educational Exploration*, 2018(3), 6.
- [7] Song, W., & Sun, Z. (2014). The relationship between TPACK and self-efficacy and technology acceptance of primary school teachers in digital teaching materials environment—a structural equation analysis. *China Distance Education*, 2014(17), 8.
- [8] Xiao, L., Bai, Y., & Apollo. (2016). A case study of TPACK level of primary school mathematics expert teachers. *Educational Theory and Practice: Primary and Secondary Education Teaching Edition*, 2016(2), 4.
- [9] Zhou, L., & Huang, D. (2016). Study on the development model of rural teachers' TPACK (subject teaching knowledge of integrated technology) based on the teaching process—Taking the information technology ability training of primary and secondary school teachers in Shaoguan as an example. *Primary and Secondary School Teacher Training*, 2016(8), 5.