

Twenty Years of Research on Education for Left-behind Children in Rural China: A Structural Topic Model Analysis (Postprint)

Authors: Wang Xing, Li Yeye, Zhou Tianyu, Liu Feng

Date: 2024-04-03T00:00:00+00:00

Abstract

[Purpose/Significance] With the introduction of national poverty alleviation policies and the Rural Revitalization Strategy, the issue of left-behind children's education has drawn particular scholarly attention. However, research literature on left-behind children's education remains fragmented and dispersed, necessitating systematic exploration. This study aims to uncover the thematic content and evolutionary patterns of research findings on left-behind children's education, thereby providing more profound theoretical support for policy-making and practice. [Method/Process] This study constructed a corpus from abstract texts of 2,037 journal articles published between 2002 and 2023, utilized the Structural Topic Model method for topic modeling of the corpus, and investigated the relevant extant literature and development trends from perspectives of thematic diversity and dynamics. [Results/Conclusion] Through topic modeling analysis, eight key research themes were ultimately identified: mental health, antecedents of left-behind children, coping strategies (macro), guardianship types, review studies, family education, media literacy, and coping strategies (micro). Finally, based on these findings, future research directions are proposed.

Full Text

Abstract

[Purpose/Significance] With the introduction of national poverty alleviation policies and rural revitalization strategies, the education of left-behind children has attracted special attention from scholars. However, research literature on left-behind children education remains scattered and fragmented, necessitating systematic investigation. This study aims to reveal the thematic content and evolutionary patterns of research findings on left-behind children education to provide deeper theoretical support for policy formulation and practice.

[Method/Process] This study constructed a corpus using abstract texts from 2,037 journal articles published between 2002 and 2023, employing the structural topic model (STM) method for topic modeling to examine the existing literature and development trends from the perspectives of thematic diversity and dynamism. **[Results/Conclusions]** Through topic modeling analysis, eight key research themes were identified: psychological health, antecedents of left-behind children, coping strategies, guardianship types, review studies, family education, media literacy, and coping strategies. Finally, based on these findings, future research directions were proposed.

Keywords: left-behind children; topic modeling; structural topic model; information literacy

1 Introduction

Since the 1980s, China's rapid socioeconomic development and accelerating industrialization and urbanization have created numerous employment opportunities in cities, leading to a continuous migration of rural labor to urban areas. The migrant worker population has become an indispensable force in China's economic takeoff. However, constrained by the household registration system and economic conditions, many migrant workers face difficulties in arranging childcare, resulting in many leaving their children in rural areas. This has gradually formed the phenomenon of rural left-behind children [1]. According to Ministry of Education statistics, in 2021 China had 11.9865 million rural left-behind children in primary and junior high schools. The absence of family education and harsh living conditions have led to numerous educational problems, such as learning difficulties, high dropout rates, and poor academic performance [2].

The Chinese government has consistently prioritized left-behind children issues, issuing the *Opinions on Strengthening the Care and Protection of Rural Left-Behind Children* and proposing in the 14th Five-Year Plan to improve the care system for left-behind children and consolidate achievements in compulsory education dropout prevention. Education serves not only as a means for left-behind children's personal development and human capital accumulation but also as a crucial measure for consolidating rural poverty alleviation achievements, interrupting poverty transmission, and realizing rural revitalization. Consequently, the education of left-behind children has garnered widespread academic attention, necessitating deeper organization, synthesis, and evaluation of existing literature to establish a foundation for future research and more cohesive research agendas.

Current literature review studies primarily fall into three categories: (1) traditional qualitative reviews, which analyze limited numbers of articles and yield relatively subjective results; (2) meta-analysis [5]; and (3) visualization analysis methods based on Citespace [6]. These methods cannot mine long text information such as abstracts. Artificial intelligence and machine learning technologies

now enable large-scale text processing and in-depth analysis. For instance, Du Yanping [7] used LDA topic models to analyze teacher team construction reform policy texts, while Dong Wei [8] applied machine learning techniques to identify and analyze evolutionary characteristics of research themes in higher education internationalization. Wang Yurong [9] employed LDA topic models to mine news reports and online comments about left-behind children.

However, LDA topic models have significant limitations: they cannot represent how topics and words change with covariates within documents, and they assume topics are independent, not allowing correlations between topics. To overcome these limitations, this study adopts the structural topic model (STM) developed by Roberts [13]. STM is an extension of LDA and related topic models that directly estimates the influence of covariates on topic prevalence or word usage within topics to address LDA's limitations. Compared with LDA, STM has three distinct differences: it allows topic correlation, each document has its topic distribution as a function of covariates, and word distributions may also change due to covariates.

STM has recently been introduced to the topic modeling family and has been applied in sociology. Wang Shunyu [14] analyzed thematic changes and differences in international academic discourse using STM, while Zhao Bei [15] examined social bot narratives and stance biases regarding the Beijing Winter Olympics. However, no application of STM in education research has been identified.

2.1 Background

Topic modeling is a text mining technique for discovering major themes or trends in large unstructured data collections. It can quickly and effectively reveal hidden semantic structures in vast corpora. STM is also a probabilistic generative model that defines generated documents as mixtures of hidden topics with different prevalences, explaining that specific documents are produced through a data generation process using multiple topics.

For a corpus, assuming K latent topics form a latent semantic space where each word can be represented as a K -dimensional vector. In this case, the total topic proportion is 1. For a specific topic, the total word probability is also 1. For a document, the distribution across all topics can be summarized using the top n words ranked according to the corresponding conditional probability called prevalence.

[Figure 1: see original paper] illustrates the structural topic model, where D_i represents documents in the corpus, T_k represents latent topics in the corpus, w_j represents words constituting topics, and X represents covariates. Model parameters ϕ and β assume random variables in STM are extracted from log-normal distributions, while β_x represents topic-vocabulary distributions. The generation process of STM is complex; for more technical details please refer to [16].

3.1 Research Framework

To conduct this study, we adopted the structural topic model. The research framework includes: - **Data Collection**: Database selection, search query construction, and literature data acquisition - **Data Preprocessing**: Removing punctuation, numbers, stopwords; building professional glossaries; constructing word vectors - **Optimal Topic Number**: Determining the optimal number of topics - **Knowledge Discovery**: Topic result visualization and topic network construction

[Figure 2: see original paper] presents the research framework for this study.

3.2 Data Collection

This study used the China National Knowledge Infrastructure (CNKI) database to collect journal literature on rural left-behind children education. The search query was constructed as: ((TI= 'left-behind children' + 'rural left-behind children') AND (TI= 'education')) OR ((KY= 'left-behind children' + 'rural left-behind children') AND (KY= 'education')). All search results were manually reviewed, and irrelevant records such as journal calls for papers were removed. After these two steps, 2,037 relevant articles were obtained, with bibliographic information including titles, abstracts, and institutions stored in Excel. The time span covers 20 years from January 2003 to January 2023. lists 24 journals that published more than 10 papers.

3.3 Data Preprocessing

3.3.1 Data Cleaning

The first step in data preprocessing is removing punctuation and meaningless words from the text. This study wrote programs in Python using the Harbin Institute of Technology stopword list for data cleaning.

3.3.2 Glossary Construction

The purpose of building a professional glossary is to ensure professional terms are not segmented. Based on keywords from the collected literature and common concepts in left-behind children research, a professional glossary was constructed. For example, adding "left-behind children" as a term ensures it is not segmented into "left-behind/children." A partial glossary is shown in .

3.3.3 Word Segmentation

Before modeling, texts must be segmented by adding spaces between words. English texts use spaces as word delimiters, but Chinese texts require segmentation tools. This study used the Jieba library in Python to complete word segmentation. For example, the segmentation result for "农村留守儿童教育问题" (rural left-behind children education issues) would be "农村留守儿童教育问题."

3.3.4 Word Vector Construction

Word vectors form the basis for computer programs to understand text semantics. Texts must be vectorized for representation. This study used TF-IDF (Term Frequency-Inverse Document Frequency) to quantify the relative importance of each term in the corpus. TF-IDF values consist of two components: TF evaluates term frequency, and IDF evaluates inverse document frequency. The TF-IDF value for the i -th keyword can be calculated through the formula:

$$TF-IDF_i = TF_{ij} \times IDF_i$$

where TF_{ij} represents the frequency of the i -th keyword in the j -th document, and $IDF_i = \log \frac{N+1}{n_i+1}$, where N is the total number of documents and n_i is the number of documents containing the i -th keyword. This study used the `quantda` package [17] in R to calculate TF-IDF values.

3.4 Optimal Topic Number

The most important step in STM is specifying the number of topics K . Determining the value of K aims for substantive interpretation rather than maximum model fit. Consistency and exclusivity are two key indicators for interpreting model results. High consistency indicates that top words in a topic are likely to co-occur in documents, while high exclusivity means high-probability words in a topic typically do not appear in other topics [19].

Using the STM package in R, topic models were run with K ranging from 3 to 20 (18 models total). Consistency and exclusivity scores were calculated and plotted in [Figure 3: see original paper]. The figure shows that when topic numbers are small, models exhibit low exclusivity and high semantic consistency (lower right region). When topic numbers are large, models show high exclusivity but low semantic consistency (upper left region). When K ranges from 6 to 9, models demonstrate relatively balanced semantic consistency and exclusivity. We selected $K=8$ as this setting produced the strongest semantic consistency, exclusivity, and interpretability.

4 Results

4.1 Descriptive Results

[Figure 4: see original paper] depicts the annual distribution of published journal articles and total articles including newspapers and conference papers. Rapid growth in left-behind children education research can be observed since 2004. The first journal article on left-behind children education was published in 2003, peaking at 170 articles in 2013. Before 2014, the trends for journal articles and total literature were similar. After 2014, the number of journal articles gradually decreased, while total publications including conferences continued to increase, reaching a peak of 527 articles in 2019 before declining.

4.2 Structural Topic Model Results

STM assigns specific keywords from the document corpus to latent topics based on semantic associations. In this case, each topic can be summarized using a small set of keywords. We extracted the top 20 keywords associated with each theme. To determine the specific content of each topic, the results are presented in . The STM topic model identified eight research themes related to left-behind children education issues, which can be further categorized into seven areas: psychological health, antecedents of left-behind children, coping strategies, guardianship types, review studies, family education, and media literacy.

4.2.1 Psychological Health Theme 1 concerns the psychological health issues of left-behind children. Separation from parents occurs during a critical stage of physical and mental development, making psychological health problems a widespread concern in rural left-behind children education [20]. Liu Hongyan [21] found that parental migration for over four months negatively impacts left-behind children's mental health, and while parental return can alleviate some negative effects, it cannot repair psychological problems in adolescents. Wang Xinqiang [22] studied 1,066 left-behind children across five different economic zones, dividing children's mental health into four dimensions (positive-negative, internalized-externalized). The study found that left-behind children scored lower than non-left-behind children on positive mental health dimensions such as life satisfaction and happiness. Yang Xueling [23] discovered that university students with left-behind experiences may have lower psychological resilience and higher suicide risk. Psychological intervention has proven effective in improving left-behind children's mental health levels. Bai Qin [24] designed and implemented a training intervention model that significantly improved left-behind children's mental health.

4.2.2 Antecedents of the Left-Behind Children Phenomenon Theme 2 involves the antecedents of the left-behind children phenomenon. The urban-rural dual system is the direct cause of left-behind children [25]. Economic pressure, difficulties in children's education, and high mobility are fundamental reasons why migrant workers choose to leave their children in their hometowns [27]. In a survey of reasons why parents choose to leave children at home, 63.7% cited heavy family economic pressure, high living costs, and tight work schedules as primary reasons preventing them from bringing children with them [27].

4.2.3 Coping Strategies Themes 3 and 8 both reflect coping strategies for left-behind children education issues. To more deeply explore differences between them, we calculated and visualized the probability differences in keywords between the two themes. [Figure 5: see original paper] demonstrates the vocabulary differences. Theme 3 focuses on micro-level solutions to current left-behind children education problems, emphasizing implementing government responsibilities, systematically improving rural cultural ecological environments,

implementing legal protection and education, and building rural teacher teams. Theme 8 focuses on macro-level perspectives concerning rural future construction and development, proposing coping and mitigation strategies for left-behind children education issues. Building an education guardianship system centered on boarding schools is crucial for solving rural education problems.

4.2.4 Guardianship Types of Left-Behind Children Theme 4 concerns guardianship types of left-behind children. Ye Jingzhong [30] investigated guardianship situations in 10 rural communities in central and western China, categorizing left-behind children's guardianship into four types: single-parent guardianship (father or mother), grandparent guardianship, other adult relatives, and teacher guardianship. Fan Xinghua [31] studied 593 left-behind children and 353 children under parental co-guardianship, finding that left-behind children under grandparent or relative guardianship exhibited more problem behaviors (disciplinary violations, behavioral adaptation difficulties) than children under parental guardianship. Different guardianship types also have varying impacts on left-behind children's mental health [32].

4.2.5 Review Studies Theme 5 primarily reflects review studies that synthesize existing literature to analyze causes, consequences, and coping strategies for left-behind children education issues. Review studies on left-behind children education fall into three categories: qualitative review methods, meta-analysis, and Citespace-based visualization analysis, which have been discussed in the introduction and will not be elaborated here.

4.2.6 Family Education Theme 6 discusses the absence of family education for left-behind children. The biggest problem facing left-behind children is the lack of family education, which is not an inherent difference between left-behind and non-left-behind children but rather a difference created by their growth environment [33]. Family education is closely related to children's personality and character development. The absence of family education can cause problems in academic performance and physical development [33]. Family is the most important socialization setting for children [34], and the lack of family education amplifies the influence of peer groups. Without proper parental guidance, left-behind children are prone to join negative peer groups and deviate from correct values during socialization, potentially leading to delinquent behavior [6]. Family education plays a crucial function in children's growth, and schools and teachers are becoming the main environment and companions for left-behind children, playing an increasingly important role in their spiritual world [37].

4.2.7 Media Literacy Media literacy refers to the cognition formed about media content. Media is an important factor influencing children's socialization development [38]. Television, mobile phones, and other media are necessary windows for left-behind children to obtain learning and life information and maintain communication with parents. Media literacy has significant impacts

on children' s cognition and interpersonal relationships [39]. In the digital environment, rural left-behind children' s media literacy has attracted attention. Research shows that rural left-behind children generally lack media literacy knowledge, have single family media environments, and lack school education and facilities for media literacy [40]. Media literacy has been proven to positively correlate with left-behind children' s learning abilities [41]. With technological development, smartphones have entered the lives of some left-behind children. The popularity of video calls and other communication methods has created convenient and stable emotional communication channels between left-behind children and parents, compensating for some negative effects of family education absence [42]. However, this cannot fully replace parental companionship.

4.3 Topic Development Trends

A major advantage of structural topic models is the ability to study interactions between covariates and topics. By setting publication year as a covariate, we can examine how topics change over time. [Figure 6: see original paper] shows the dynamic changes of topics over time, revealing each topic' s popularity over the past 20 years. Hot topics show increasing trends, cold topics show decreasing trends, and some remain stable. Future research can further analyze the causes of these trends.

5.1 Research Findings

The field of left-behind children education has produced substantial research. Accurately identifying main research themes and trends is time-consuming and challenging. This study used STM to comprehensively review 2,037 papers from 777 journals spanning January 2002 to January 2023. The study presents an overall overview and knowledge structure of left-behind children education research. Based on semantic consistency and exclusivity, eight research themes were identified, and publication year was used as a covariate to determine thematic evolution trends.

Over the past 20 years, academic attention to left-behind children education has focused on antecedents, consequences, and mechanisms. Research trends on psychological health, media literacy, and coping strategies are rising. Future research should prioritize problems caused by the absence of family education, using multiple methods such as psychological experiments, empirical studies, and long-term tracking to deeply understand how left-behind children cope with difficulties and adversity, providing scientific evidence for targeted intervention strategies.

5.2 Future Outlook

Based on the literature review and analysis, future research can expand in several directions:

Deepen research on psychological health issues: Further explore mechanisms, risk factors, and protective factors of left-behind children's mental health problems, including interactions with family background, social support, and cultural factors.

Investigate antecedents of left-behind children: Further study the causes of left-behind children from multi-level perspectives including family background, parenting styles, and sociocultural contexts to provide more scientific evidence for targeted interventions.

Strengthen review studies: Enhance methodological applications including systematic literature reviews and meta-analyses to more comprehensively summarize existing research findings.

Explore coping strategies: Investigate left-behind children's own coping strategies including emotion regulation, self-management, and social skills to better understand their actual coping behaviors when facing difficulties.

Examine guardianship types: Deeply explore how different guardianship types affect left-behind children's mental health, academic adaptation, and other long-term outcomes.

Integrate family education: Incorporate family education into comprehensive intervention models for left-behind children education, emphasizing its importance.

Focus on media literacy development: Deeply investigate left-behind children's media usage behaviors, habits, and impacts in digital media environments, including social media use, online gaming, and online learning, and explore cultivation strategies and effectiveness evaluation for media literacy.

Evaluate policies and practices: Assess and improve left-behind children education policies and practices to promote policy implementation and provide better educational opportunities.

Interdisciplinary collaboration: Promote collaboration across disciplines such as education, psychology, sociology, and social work to advance left-behind children education research.

5.3 Research Contributions and Limitations

This study's contributions are: (1) Using STM, a machine learning-based method, to mine literature and overcome LDA limitations; (2) Allowing scholars to quickly obtain comprehensive information from large numbers of research papers; (3) Systematically revealing thematic evolution trends over time by integrating document metadata.

Limitations include: (1) Only collecting article abstracts rather than full texts, which may not represent complete information; (2) Focusing retrieval on "left-behind children education" as keywords, potentially missing some literature; (3)

Not including graduate theses in the analysis, though some high-quality theses could be considered in future research through author-paper similarity calculations.

References

- [1] YANG J H, DUAN C R. A comparative analysis of educational opportunities for migrant, stay and other children in rural China[J]. Population research, 2008, 32(1): 11-21.
- [2] The 14th Five-Year Plan for National Economic and Social Development and Long-Range Objectives Through the Year 2035[EB/OL]. [2023-02-12]. http://www.gov.cn/xinwen/2021-03/13/content__{5592681}.htm.
- [3] GE J Y, QIN Z Y, YANG H, et al. Review and prospect of family education research on left-behind children in rural areas—Taking families raised by different generations as an example[J]. Survey of education, 2020, 9(31): 24-26.
- [4] BAI H H, WANG Y Q, SUN W J. The resilience status of left-behind children: A meta-analysis[J]. Studies of psychology and behavior, 2022, 20(2): 261-267.
- [5] REN Y C. Current problems and solutions of rural left-behind children' s education—A study based on 13 years of tracking observation[J]. Journal of Guangxi normal university (philosophy and social sciences edition), 2017, 53(6): 108-114.
- [7] DU Y P. Text analysis on the reform policy of teachers construction in the new ERA—Based on LDA modeling analysis[J]. Journal of systems science and mathematical sciences, 2022, 42(6): 1411-1422.
- [8] DONG W, DONG S Y, ZHANG Y N. An analysis of identification and evolution characteristics of research topics in the internationalization of higher education in China—A perspective based on text mining[J]. Theory and practice of education, 2021, 41(36): 3-7.
- [9] WANG Y R, XIANG G X. Differentiated construction of left-behind children' s media image—Based on the analysis of news and commentary text[J]. Modern communication (journal of communication University of China), 2019, 41(6): 17-23.
- [10] HWANG S, FLAVIN E, LEE J E. Exploring research trends of technology use in mathematics education: A scoping review using topic modeling[J]. Education and information technologies, 2023, 28(8): 10753-10780.
- [11] ODDEN T O B, MARIN A, RUDOLPH J L. How has Science Education changed over the last 100 years? An analysis using natural language processing[J]. Science education, 2021, 105(4): 653-680.
- [12] TIAN Y, GONG T T. Topic mining of online teaching demand data based on LDA model[J]. Information science, 2021, 39(9): 110-116.

- [13] ROBERTS M E, STEWART B M, TINGLEY D. Stm: An R package for structural topic models[J]. *Journal of statistical software*, 2019, 91(2): 1-40.
- [14] WANG S Y, CHEN R Z. A structural topic modeling of international academic discourse on the Belt and Road Initiative: Themes, trends and differences[J]. *Foreign language education*, 2022, 43(4): 8-14.
- [15] ZHAO B, ZHANG H Z. Social bots narrative and position tendencies about the Beijing Winter Olympics—Structural topic model (STM) analysis based on twitter data[J]. *Journalism and mass communication*, 2022(5): 62-70.
- [16] ROBERTS M E, STEWART B M, AIROLDI E M. A model of text for experimentation in the social sciences[J]. *Journal of the American statistical association*, 2016, 111(515): 988-1003.
- [17] BENOIT K, WATANABE K, WANG H Y, et al. Quanteda: An R package for the quantitative analysis of textual data[J]. *Journal of open source software*, 2018, 3(30): ID 774.
- [18] CHANG J, BOYD-GRABER J, GERRISH S, et al. Reading tea leaves: How humans interpret topic models[J]. *Advances in neural information processing systems 22—proceedings of the 2009 conference*, 2009, 22: 288-296.
- [19] ROBERTS M E, STEWART B M, TINGLEY D, et al. Structural topic models for open-ended survey responses[J]. *American journal of political science*, 2014, 58(4): 1064-1082.
- [20] ZHAO F. Mental health status of left-behind children in rural areas and educational countermeasures[J]. *Journal of capital normal university (social sciences edition)*, 2010(3): 128-130.
- [21] LIU H Y, CHANG F, YUE A, et al. The impact of parental migration on the mental health of rural left-behind children[J]. *Peking university education review*, 2017, 15(2): 161-174, 192.
- [22] WANG X Q, HUO J Y, ZHANG D J, et al. The relationship between mental health and child abuse and their difference between left-at-home children and those living with their parents in rural areas: An analysis based on the two-dimensional four-factor mental health structure[J]. *Chinese journal of special education*, 2018(1): 58-64.
- [23] YANG X L, FENG X G, CUI Z T. Relation of left-behind experience to psychological resilience and psychopathological symptoms in college students[J]. *Chinese mental health journal*, 2014, 28(3): 227-233.
- [24] BAI Q, LIN Z Y, TAN K M. An experimental study on the training mode of left-behind children in rural areas of China—Based on the quantitative analysis of the changes of mental health status after on-the-spot intervention[J]. *Management world*, 2012(2): 62-72.
- [25] YE J Z, WANG Y H. The current situation and characteristics of care taking for children left behind[J]. *Population journal*, 2006, 28(3): 55-59.

- [26] FAN X H, FANG X Y. A comparison of problem behaviors between parent-present children and parent-absent children in different care-taking modes[J]. Chinese journal of clinical psychology, 2010, 18(2): 232-234, 237.
- [27] LIU X H, WANG X J, YANG Y Y, et al. Comparison of mental health status between left-behind children under different guardianships and non-left-behind children[J]. Chinese general practice, 2012, 15(13): 1507-1510.
- [28] DUAN C R, LV L D, WANG Z P. Research on left-behind children's home education and school education[J]. Peking university education review, 2014, 12(3): 13-29, 188.
- [29] WANG Y B, WU X L. A case investigation report on the phenomenon of "left-behind children" in rural areas[J]. Youth studies, 2003(4): 7-10.
- [30] DUAN C R, YANG G, WANG Y. Investigation and research on left-behind children in rural areas[J]. Journal of Xuehai, 2005(6): 25-29.
- [31] JIANG P. Problems and countermeasures of the basic lack of family education for left-behind children in rural areas[J]. Theory observe, 2005(4): 79-81.
- [32] LUO G F. A perspective of children's rights: Re-problemization of left-behind children in rural areas[J]. Exploration and free views, 2018(1): 79-83, 143.
- [33] LU J X, YE J Z. Research on the influence of peer groups on left-behind children in rural areas of China[J]. Rural economy, 2009(12): 104-107.
- [34] FENG X K. Ideal, covering, and uncovering: A triple examination of the online game phenomenon of left-behind children in the digital age[J]. Theory monthly, 2020(12): 91-100.
- [37] DENG Y. Research on media literacy of rural left-behind children in northern Jiangsu Province[J]. Media observer, 2018(1): 24-26.
- [38] ZHAO K Y, CUI X L, YANG X, et al. An empirical study on the influence of mass media on the socialization of left-behind children in rural areas[J]. Modern distance education, 2018(3): 66-74.
- [39] ZHAO R S, JIA Y. The positive effects of the campus reality show on children's socialization[J]. Editorial friend, 2016(5): 56-59.
- [40] WANG Q H, ZHENG X. Digital compensation: A study on smartphones and the emotional socialization of left-behind children[J]. Journalism and mass communication, 2022(3): 37-47, 94.
- [41] SHI J D, LI H Y. Research status of media literacy of left-behind children in China from 2007 to 2019[J]. PR magazine, 2021(1): 74-77.
- [42] WANG S F, TAN Q A. How to create a new digital culture environment for teenagers in poor rural areas under the background of rural revitalization:

Based on a study on internet use behavior and library services needs of left-behind children[J]. Journal of library and information science in agriculture, 2022, 34(1): 16-37.

Note: Figure translations are in progress. See original paper for figures.

Source: ChinaXiv—Machine translation. Verify with original.