

A Systematic Review on the Challenges and Pathways for the Integration of Open Education and Vocational Education in China

You Yang^{a,b,*} , Mohamad Sattar Rasul^a, Marlissa Omar^a

^aUniversiti Kebangsaan Malaysia, Bangi Selangor, 43600, Malaysia

^bJiangsu Open University, Nanjing, 210036, China

* Correspondence: p120552@siswa.ukm.edu.my

Received: 11 December 2023; Accepted: 08 February 2024; Published: April 2024

Abstract

The integration of open education and vocational education is not merely a pivotal political initiative but also holds substantial theoretical and practical significance. To conduct this research as a systematic review, data were extracted from prominent Chinese databases like CNKI, Wanfang Data, and VIP Information, adhering to the Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) 2020 checklist. This ensured a meticulous and comprehensive analysis of systematic review. Synthesizing and scrutinizing findings from the final selection of 124 articles spanning 2013 to 2023, the research underscored the challenges hindering the fusion of open education and vocational education and some factors to develop pathways for its facilitation. The findings reveal that the ineffective construction and integration of educational resources, differences in components of the education system and inadequate integration management mechanism face significant challenges. Also, based on the integration theory and utilizing the Critical Path Method (CPM) approach, research findings indicate that the integration of open education and vocational education in China can occur through proposed critical pathways, such as teachers' development, major and curriculum construction, educational resources, learning outcomes and qualifications, among others. Additionally, these research findings are poised to better provide critical direction for advancing the integration of open education and vocational education in future endeavors.

Keywords: Open Education; Vocational Education; Challenges; Pathways; Systematic Review

To cite this article: Yang, Y, Sattar-Rasul. M., Omar, M. (2024). A Systematic Review on the Challenges and Pathways for the Integration of Open Education and Vocational Education in China. *Multidisciplinary Journal for Education, Social and Technological Sciences*, 11(1), 72-98. <https://doi.org/10.4995/muse.2024.20863>

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Mult. J. Edu. Soc & Tec. Sci. (2024), 11(1), 72-98. <https://doi.org/10.4995/muse.2024.20863>

1. Introduction

In 2019, the Central Committee of the Communist Party of China and the State Council issued "China Education Modernization 2035", emphasizing the imperative of "coordinated development of basic education, vocational education, higher education, and continuing education," "increased focus on integrated development," and "establishment of a modern education system catering to lifelong learning for all" (Central Committee of the Communist Party of China and the State Council 2019). During the National Vocational Education Conference in 2021, General Secretary Xi Jinping emphasized the "deep integration of modern information technology and education," aiming to "construct a high-quality vocational education system with horizontal integration as the goal," emphasizing the importance of enhanced "communication" and "linkage" among various education types (Xi, 2021). In 2022, the report from the 20th National Congress of the Communist Party of China further emphasized the "coordinated innovation among vocational education, higher education, and continuing education" (Xi, 2022). Therefore, promoting the integration and advancement of vocational education and open education stands as a crucial political aspiration and mission in constructing a high-quality education system and building a strong nation in education.

Also, numerous researchers have substantiated the necessity, value, and theoretical foundation for investigating the integration of open education and vocational education. The symbiotic relationship between vocational education and open education embodied mutual advantages, where their integrated development leveraged their respective strengths and shares resources for mutual enhancement (Yang, 2023).

Open education fulfilled vocational demands in employment, quality, and skill development, while vocational education necessitates pre-service and post-service open education, underscoring the imperative for their integration (Zhang, 2015; Peng, 2016; Liu, 2017; Hu, 2019; Liu & Wang, 2022). Analyzing the characteristics and theoretical foundations of both fields, Li Wei (2018), Hu (2020), Jiang & Yin (2021), and Yang (2023) concluded that their integration compensates for respective deficiencies. Perspectives from school-enterprise cooperation and campus culture endorsed the feasibility of this integration (Song, 2021; You, 2021). Moreover, Song (2021) suggested that aligned educational objectives and professional settings bolster this integration, emphasizing complementary teaching methods and shared resources. Therefore, the integration of

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open education and vocational education has not only received comprehensive theoretical support but has also vividly demonstrated their mutually complementary relationship in practical application.

Several higher education institutions have undertaken practical explorations into this integration yet encountered challenges. Inadequate establishment of an open education system and mechanism hindered the integration process, particularly in aligning professional and curriculum development (Hu & Hu, 2019; Yang, 2023). A lack of teacher recognition regarding the importance of integration resulted in disparities during teaching implementation (Hu & Hu, 2019; Zeng & Qi, 2020). Additionally, experts proposed integration pathways, emphasizing theoretical research, driving mechanisms, top-level designs, societal service, and institutional environment enhancement (Hu & Hu, 2019; Zeng & Zhang, 2022; Yang, 2023).

This systematic literature review utilizes the content analysis and bibliometrics to comprehensively analyze issues and factors to develop pathways for resolving integration challenges from 2013 to 2023. It seeks to identify and clarify challenges in integrating open education and vocational education while providing theoretical grounding and feasible pathways for targeted integration promotion.

Several higher education institutions have undertaken practical explorations into the integration of open education and vocational education in China. Shen Zhen Vocational and Technical College fully absorbed and drew from the advanced teaching techniques, school-running concepts, learning methods, and learning support service systems of open education. They have established a "5G+XR" teaching system (Rui et al., 2021). Panjin Vocational and Technical College has explored the integration of the open university model with higher vocational education, including ideological and political education through network platform courses, a blended approach with "golden courses" both online and offline, high-quality open online courses, and the development of job-specific technical skills courses based on the "craftsman spirit." Additionally, they have strengthened the ideological qualities and capabilities of professional teachers (Zhang, 2022). Guangdong Open University has facilitated the collaborative development of open education and vocational education by establishing affiliated vocational and technical schools and implementing integrated talent cultivation for secondary and specialized education as well as seamless transition from higher vocational to undergraduate education (Long & Zhong, 2019). Fujian Open University has introduced a "dual-

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system" of vocational education into the field of adult education, integrating the concepts of open education and vocational education. They have innovated a distinctive talent development model known as the "dual-system of open education" specifically tailored for enterprise employees (Liu, 2022). Ningxia Open University and Ningxia Vocational and Technical College, using accounting as an example, have explored ways to promote the integration and coordinated development of teaching resources under two different educational models through collaborative course development, sharing of practical training resources, and establishing institutional constraints on the teaching faculty (Xin, 2023). Therefore, the integration of open education and vocational education is increasingly receiving attention in Chinese higher education institutions. Through practical initiatives, significant progress has been made in this integration direction.

However, the theoretical and practical aspects of the integration and development of vocational education and open education were still in the shallow stage of "grafting" integration (Song & Shen, 2018). The current integration status between open education and vocational education has made some progress, but it could be better (Hu & Hu, 2019). Although researchers have delved deeply into the integration of open education and vocational education, this exploration is not comprehensive and systematic enough. Therefore, this study employs content analysis and bibliometrics from 2013 to 2023 to systematically and comprehensively analyze relevant issues and factors. Through a thorough examination of existing literature, it aims to provide a systematic and comprehensive analysis of the current status, issues, and trends in the integration of open education and vocational education. By comparing and integrating the perspectives of different researchers on the integration of open education and vocational education, this study intends to offer specific and actionable recommendations for advancing the integration of open education and vocational education in China.

Here the manuscript is introduced. The section headings and subheadings are arranged by numbers. Leave a clear line between sections or subsections.

2. Theoretical framework

During the process of integrating open education and vocational education, some challenges have been encountered. Currently, there are significant differences in social value recognition between

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open universities and higher vocational colleges. Moreover, there was a lack of depth and consensus in understanding the integration, and insufficient motivation among participating entities, which has impacted the integration of open education and vocational education (Zeng & Qi, 2020; Yang, 2023). The lack of intimacy in the integration of open education and vocational education was attributed to the absence of a sound institutional mechanism (Hu & Hu, 2019; Chen, 2021; Yang, 2023). The differences in management models, talent cultivation, and educational objectives between open education and vocational education also influenced the integration (Zeng & Qi, 2020; Chen, 2021; Liu, 2022). Additionally, disparities in teaching organization implementation, faculty construction, and curriculum standards posed challenges to the integration of open education and vocational education (Zeng & Qi, 2020; Liu, 2022; Qiu et al., 2023). Chen (2021) further suggested that inadequate funding in the integration of open education and vocational education contributed to the less-than-ideal outcomes. Jiang & Yin (2021) pointed out that a major issue in current research on the integration of open education and vocational education was the limited focus on how open education could better serve the national vocational demand orientation and how vocational education could better integrate into the national open education system. Sun et al., (2023) proposed that open education and higher vocational education shared consistency in talent development goals and cross-disciplinary development, differing mainly in the student demographic.

Based on the current research, concerning the challenges in the integration process of open education and vocational education, different researchers have identified common issues while also presenting unique aspects. However, these studies exhibit a scattered pattern in summarizing challenges, lacking systematic and comprehensive analyses, and some challenges persist. Only through a comprehensive and systematic analysis of the challenges in the integration process of open education and vocational education can a more scientifically and logically formulated integration path be achieved.

In response to the challenges encountered in the integration of open education and vocational education, existing research has put forth specific theoretical measures for resolution. Due to the commonalities in curriculum goals, teaching content, and faculty development between open education and higher vocational education, the integration and sharing of course resources between these two types of education could be achieved through the "Super Star Learning Platform" (Zhou, 2021). Chen (2021) proposed measures for the development of the integration of open education and vocational education, including strengthening top-level design, innovating the development of

institutional mechanisms for integration, building expert faculty teams, creating a digital platform for integrated development, and integrating and optimizing high-quality educational resources. Zhou (2022) stated that the participation of open education in the 1 + X certificate system pilot project is conducive to achieving deeper integration between open education and vocational education. Wang (2023) suggested that through channels such as the unification of teaching philosophies and the sharing of course resources, the integration and innovation of courses between open education and higher vocational education can be realized. Wang (2023), using the example of the comprehensive training course in mechatronics systems integration, pointed out that promoting the integration of higher vocational education and open education can be facilitated through the sharing of resources within and outside the school, the integration of teaching methods and content, and the strengthening of comprehensive training teaching. Yu (2023) expressed that the integration of higher vocational education and open education is not ideal in practice and requires measures in areas such as reforming the management system, strengthening the construction of course interoperability, and creating integrated online platforms to promote the in-depth integration of the two types of education. Sun et al. (2023) stated that strengthening talent cultivation with a vocational orientation, establishing regionally distinctive majors, sharing practical teaching resources, forming interdisciplinary faculty teams, and integrating a multi-disciplinary curriculum system can promote the integrated development of open education and higher vocational education, thereby cultivating versatile talents for society.

While many researchers have proposed specific and localized measures for the integration of open education and vocational education, these measures have not been systematic and lack a more comprehensive, macroscopic, and interconnected pathway. This situation hinders the achievement of deeper integration between open education and vocational education. Therefore, it is necessary to construct a more systematic and comprehensive pathway based on existing measures to enhance the integration of open education and vocational education.

3. Research questions.

Currently, there is a dearth of comprehensive literature reviews focusing on exploring the challenges and critical pathways of integrating open education and vocational education. To fill this

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gap in literature, the research questions for this systematic literature review were formulated as follows:

- i. What challenges exist in the process of integrating the open education and vocational education?
- ii. What are the factors to be considered in developing pathways to promote the integration of open education and vocational education?

4. Data and method

The A systematic review utilized explicit, systematic methods to collate and synthesize findings from studies that addressed a clearly formulated question (Rethlefsen et al. 2021). The PRISMA 2020 statement offered updated reporting guidelines for systematic reviews, encompassing advancements in methods to identify, select, appraise, and synthesize studies (Page, M.J.et al. 2021). Familiarity with PRISMA 2020 proved beneficial in planning and conducting systematic reviews, ensuring comprehensive inclusion of recommended information. Khalil Awan et al. (2021) conducted a study on the widespread adoption of e-learning by teachers and students since 2005 and employed the PRISMA search technique for a systematic analysis and put forward various strategies, policies, and recommendations for the effective implementation of e-learning. PRISMA 2020 outlined four stages: identification, screening, eligibility, and inclusion (Meinck et al. 2022).

4.1. Flow chart for selecting process of articles

Understanding trends in specific research fields and topics often require scrutiny of academic publications. In this systematic review, the article selection process was depicted in Figure1.

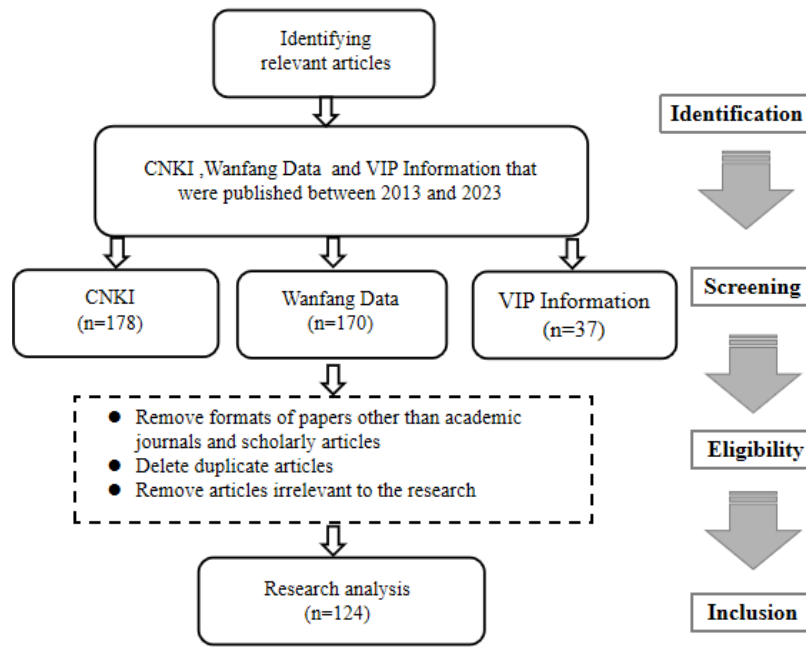


Figure 1. Flow chart for selecting process of articles

4.2. Data collection process

Phase I: Identifying phase

The researchers initially conducted a search to identify pertinent research material on the subject. In this phase, relevant publications from three major Chinese journals and databases—CNKI, Wanfang Data, and VIP Information—published between 2013 and 2023 were selected. CNKI, Wanfang Data, and VIP Information are three databases that encompass a wealth of Chinese academic resources, including scholarly journals and theses. By utilizing these databases, we can gain a deeper understanding of the latest developments and research outcomes in the Chinese academic community related to the research field. In comparison to international databases, these local databases are more closely aligned with the research, facilitating access to more in-depth information. This allows us to comprehensively grasp relevant academic trends and the research achievements of local scholars in this field. In 2012, six Radio and Television Universities were first renamed as Open Universities, initiating open education (Jiang & Yu, 2019). In 2013, research on open education gradually

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increased. The selection of the time period from 2013 to 2023 is due to the richer availability of literature on the integration of open education and vocational education during this timeframe, enhancing the research's significance. This time span encompasses the latest research findings and academic perspectives, providing robust support for in-depth analysis and comprehensive understanding of the challenges and pathways in this field. To ensure a comprehensive and accurate retrieval of articles directly relevant to this research and enhance the credibility and reliability of the information, a combined search strategy using keywords, subject terms, and title searches were employed. Advanced and precise searches were conducted across the CNKI (China National Knowledge Infrastructure), Wanfang Data, and VIP Information databases. This comprehensive search approach aims to ensure the inclusion of a wide range of literature resources, filtering content relevant to the research from diverse perspectives to support the depth and reliability of the research.

The search produced the following results: Keywords: “Open Education” and “Vocational Education” and “Integration”; Subject: “Open Education” and “Vocational Education” and “Integration”; Title: “Open Education” and “Vocational Education” and “Integration” (Table 1).

Table 1. The research string used for the systematic review process.

Databases	Keywords used	Subject used	Title used
CNKI	“Open Education” and “Vocational Education” and “Integration”	“Open Education” and “Vocational Education” and “Integration”	“Open Education” and “Vocational Education” and “Integration”
Wanfang Data	“Open Education” and “Vocational Education” and “Integration”	“Open Education” and “Vocational Education” and “Integration”	“Open Education” and “Vocational Education” and “Integration”
VIP Information	“Open Education” and “Vocational Education” and “Integration”	“Open Education” and “Vocational Education” and “Integration”	“Open Education” and “Vocational Education” and “Integration”

A total of 385 articles were retrieved from CNKI, Wanfang Data, and VIP Information, including journal papers, academic articles, conference papers, newspapers, patents, and others through the search process (Table 2).

Table 2. Statistical data on relevant articles from journal sources.

Chinese journal database	Keywords phase I	Keywords phase II	Subject phase I	Subject phase II	Title phase I	Title phase II
CNKI	5	4	143	121	30	27
Wanfang data	23	23	112	93	35	35
VIP information	6	6	0	0	31	31

Phase II: Screening phase

From the initial 385 articles retrieved during the identifying phase, academic journals and scholarly papers were retained, while other sources such as conference papers, newspapers, patents, and similar forms were eliminated to meet in Table 3's inclusion section. A total of 340 academic journal papers and scholarly articles were retained, while 45 papers were removed as ineligible. Academic journals and scholarly papers typically undergo peer review by experts within the respective field, ensuring a high level of academic credibility and authority. Therefore, they can provide more reliable support for our research. See Table 2.

Phase III: Eligibility phase

During the screening phase, out of the initial 340 articles retrieved and screened, all duplicates found across articles sourced from databases using keywords, subject terms, and titles were removed to meet in Table 3's inclusion section. Ultimately, 174 articles were retained, while 166 duplicate articles were eliminated as ineligible.

Phase IV: Inclusion phase

The content of the articles screened during the eligibility phase was individually reviewed to ensure alignment with the research objectives. Articles irrelevant to the research purpose were removed. Ultimately, 124 articles were included in the analysis for this research, while 50 papers were excluded as ineligible.

Table 3. The inclusion and exclusion criteria.

Inclusion Criteria	Exclusion Criteria
Articles Published in CNKI,Wanfang Data and VIP Information.	Articles not Publiised in CNKI,Wanfang Data and VIP Information.
Articles published between 2013 and 2023.	Articles not published between 2013 and 2023.
Articles are from academic journals and scholarly papers.	Articles are not from academic journals and scholarly papers.
The articles from different databases are not duplicates.	The articles from different databases are duplicates.
Articles precision related to the integration of open education and vocational education.	Articles not precision related to the integration of open education and vocational education.

5. Findings

The For this systematic review, a total of 124 articles on the integration of open education and vocational education in China from 2013 to 2023 were collected. These articles focused on the integration of open education and vocational education in China and were analyzed comprehensively in this section, addressing the research questions through detailed content analysis and a description of the research sample.

5.1. The challenges in the integration of open education and vocational education in China

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When reviewing literature pertaining to the primary research question, researchers thoroughly examined 124 relevant articles, synthesizing insights on 9 aspects concerning the challenges in the integration of open education and vocational education in China. These findings encapsulated the content of 84 articles, and 9 aspects were primarily published in the following 5 types of journals, as shown in Table 4.

Table 4. Major journals on the challenges in the integration of open education and vocational education in China

Journal	Journal of Liaoning Higher Vocational	Adult Education	Journal of Gansu Radio & TV University	Science Education and Culture	Journal of Henan Radio & TV University
Number of articles	11	9	6	6	5

The challenges during the integration of open education and vocational education encompassed various aspects such as "lack of depth in understanding the integration of vocational education and open education, insufficient value identification, and motivation among participating entities" (Yang, 2020; Zhang et al., 2020; Yang, 2023), "insufficient leadership, lacking a sound and effective integrated operational management system, incentive mechanism, and guarantee mechanism for integration" (Yang, 2020; Huo, 2021; Yang, 2023), "ineffective integration and sharing of resource development, weak open educational training resources, and remote education resources for vocational education" (Zhang et al., 2020; Liu & Zhang, 2021; Yang, 2023), "differences in educational concepts, teaching models, and talent development models that hinder effective integration" (Yang, 2020; Zhang et al., 2020; Yang, 2023; Zhao, 2023), "conflicts in the role of teachers, weak construction of the teaching staff, and insufficient professional development of faculty" (Zhang et al., 2020; Liu & Zhang, 2021; Zhang, 2022; Yang, 2023) and so on. See Table 5.

Among the 9 challenges in the integration of open education and vocational education, 20 articles extensively discussed "Ineffective integration and sharing of resource development, weak open educational training resources, and remote educational resources for vocational education". Additionally, 13 articles provided detailed discussions on "differences in educational concepts,

teaching models, and talent development models that hinder effective integration," while 11 articles thoroughly explored "Insufficient leadership, lacking a sound and effective integrated operational management system, incentive mechanism, and guarantee mechanism for integration." These three challenges garnered the most attention and discussion in the articles. See Table 5.

Table 5. The relevant research on the challenges in the integration of open education and vocational education in China

Challenges	Lack of depth in understanding the integration of vocational education and open education, insufficient value identification, and motivation among participating entities.	Insufficient leadership, lacking a sound and effective integrated operational management system, incentive mechanism, and guarantee mechanism for integration.	Ineffective integration and sharing of resource development, weak open educational training resources, and remote educational resources for vocational education.
Number of articles	6	11	20
Challenges	Differences in educational concepts, teaching models, and talent development models that hinder effective integration.	Conflicts in the role of teachers, weak construction of the teaching staff, and insufficient professional development of faculty.	Ineffective integration of curriculum design, single practical course settings, and a lack of deep integration between different course practical teaching methods.
Number of articles	13	9	9
Challenges	Insufficient student ability for active learning and inadequate understanding of knowledge.	Exploration and practice of learning outcome certification and transformation are not mature enough.	Imperfect integration evaluation mechanism, lacking a comprehensive evaluation system..
Number of articles	6	4	6

5.2 Pathways to promote the integration of open education and vocational education in China.

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5.2.1 The relevant research on factors to develop pathways to promote the integration of open education and vocational education in China.

When conducting a literature review for the second research question, researchers thoroughly examined 124 relevant articles and synthesized 19 pathways concerning the promotion of the integration of open education and vocational education in China. These 19 pathways were primarily published in the following 7 types of journals, as shown in Table 6.

Table 6. Major journals on factors to develop pathways to promote the integration of open education and vocational education in China

Journal	Journal of Liaoning Higher Vocational	Journal of Liaoning TV&Radio University	Journal of Chongqing Radio & TV University	Adult Education	Journal of The Open University of Guangdong	Journal of Jiangxi Open University	Journal of Guizhou Radio & Television University
Number of articles	62	59	38	26	21	21	21

These factors to develop pathways encompassed diverse aspects:

i. "strengthen top-level design, coordinate financial investment, obtain strong policy support from the government, and foster active cooperation among various sectors of society" (Yang, 2020; Huo, 2021; Zhao, 2023).

ii. "strengthen teacher training and institutional management, incentivize the enhancement of teachers' professional abilities, and promote the integrated construction and sharing of the teaching staff" (Yao, 2020; Zhang, 2022; Zhang et al., 2020; Sun, et al., 2022; Zhang, 2022; Zhao, 2023).

iii. "unify teaching philosophies, innovate teaching models, achieve the integration of teaching models, and jointly build a teaching system" (Zhong et al., 2018; Yang, 2020; Liu & Zhang. 2021; Sun et al., 2022; Zhang, 2022; Zhao, 2023).

iv. "establish mutually integrated and promoting mechanisms and systems, reform and improve management mechanisms, and achieve integrated governance and management" (Yang, 2020; Zhang et al., 2020; Yang, 2023).

v. "leverage modern information technology in educational integration, incorporate technical skills and craftsmanship spirit" (Long et al., 2019; Yao, 2020; Huo, 2021; Liu, 2022; Sun et al., 2022).

vi. "innovate 'online + offline' practical training, enhance workplace learning culture, improve practical skills, and promote the construction and integration of practical teaching systems" (Long et al., 2019; Zhang et al., 2020; Liu & Zhang, 2021; Sun et al., 2022; Zhang, 2022; Zhao, 2023), etc.

These three factors-"leverage modern information technology in educational integration, incorporate technical skills and craftsmanship spirit", "strengthen teacher training and institutional management, incentivize the enhancement of teachers' professional abilities, and promote the integrated construction and sharing of the teaching staff" and "innovate 'online+offline' practical training, enhance workplace learning culture, improve practical skills, and promote the construction and integration of practical teaching systems" each accounting for approximately 60%, 55%, and 50% of the analyzed literature, respectively (Table 7).

Table 7. The relevant research on suggestion of factors to develop pathways to promote the integration of open education and vocational education in China

Path	Factors	No. of Articles
A: Policies and Institutions	1. Strengthen top-level design, coordinate financial investment, obtain strong policy support from the government, and foster active cooperation among various sectors of society.	32
	2. Establish mutually integrated and promoting mechanisms and systems, reform and improve management mechanisms, and achieve integrated governance and management.	35
B: Teachers' Development	3. Establish a concept of integrated development between open education and vocational education and stimulate value identification and consensus among teachers regarding the realization of the "integration" concept.	28
	4. Strengthen teacher training and institutional management, incentivize the enhancement of teachers' professional abilities, and promote the integrated construction and sharing of the teaching staff.	68
	5. Unify teaching philosophies, innovate teaching models, achieve the integration of teaching models, and jointly build a teaching system.	51

	6.Improve teaching methods, integrate, and unify teaching methods.	16
	7.Leverage modern information technology in educational integration, incorporate technical skills and craftsmanship spirit.	70
C: Major and Curriculum Construction	8.Jointly constructing distinctive majors and core clusters.	7
	9.Innovate curriculum design, establish integrated curriculum standards, integrate course objectives and settings, strengthen curriculum resource construction, and jointly build a curriculum system.	50
	10.Innovate "online + offline" practical training, enhance workplace learning culture, improve practical skills, and promote the construction and integration of practical teaching systems.	62
	11.Establish standardized and effective process-based quality assessment and summary quality evaluation mechanisms.	31
	12.Establish a curriculum quality assurance system, implementing an evaluation assurance system, and enforcing a monitoring system.	7
D: Educational Resources	13.Improve the integration and collaborative construction of various educational resources.	56
	14.Adjust, integrate, and innovate teaching content.	39
E: Learning Outcomes and Qualifications	15.Innovate students registration management and credit bank operation mechanisms, establish learning support service platforms and organizations, and use credit banks to achieve certification of different learning outcomes.	39
	16.Enhance academic qualifications and jointly build a lifelong education system.	23
F: Talent Development	17.Establish an integrated, learner-centered talent development model.	37
	18.Develop matching mechanisms for targeted employment, market demands, and social service functions in talent cultivation.	36
G: Theory and Culture	19.Deepen theoretical research, enhance cultural integration.	13

5.2.2 Proposed critical pathways to promote the integration of open education and vocational education in China

This Integral theory, created by Ken Wilber in 1977, will be applied in the proposed critical pathways. It possesses the potential to address complex issues more effectively in the modern world, as highlighted by Esbjorn-Hargens (2009). This theory is typically utilized to study or analyze

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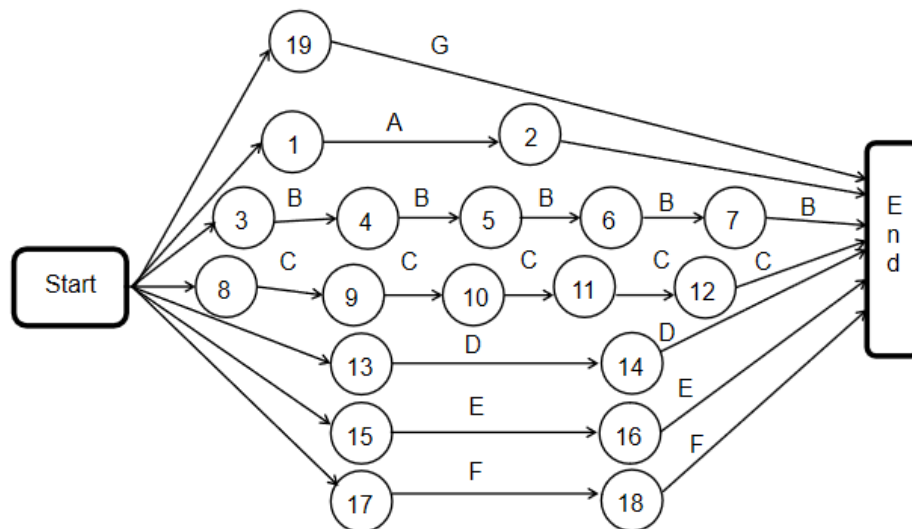
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intricate phenomena encompassing multiple domains, elements, or levels. Its overarching goal is to comprehend the interactions, integration, and influences among these elements. Through the lens of integral theory, researchers can achieve a more comprehensive understanding and devise pathways to enhance effectiveness. Integral theory also plays a crucial role in guiding the integration of open education and vocational education pathways. This theory enables researchers to conduct in-depth analyses of the elements and interrelationships influencing the fusion of open education and vocational education. It provides a comprehensive understanding of the overall integration process, facilitating the development of more comprehensive and systematic integration pathways.

The Critical Path Method (CPM) stood as a pivotal tool for coordinating diverse project activities (Nisha, 2018). Its application facilitated clearer delineation of project scheduling and critical paths (Atin & Lubis, 2019). Integrating CPM into the research might effectively foster the integration of open education and vocational education. Table 7 served as the basis for proposing critical pathways, primarily from A to G, to promote the integration of open education and vocational education in China, as depicted in Figure 2.

Pathways A-G can facilitate the integration of these two educational systems. For instance, pathway B primarily focuses on the development of teachers. This pathway begins by raising teachers' awareness of the significance of integrating open education and vocational education, with the goal of fostering a positive attitude towards integration. It encourages teachers to actively integrate the core principles and respective advantages of open education and vocational education into their teaching practices. Additionally, this pathway emphasizes the enhancement of teachers' knowledge and skills through robust training, continuous innovation in teaching methods, and refinement of instructional approaches. This equips teachers to be more adaptable and proficient in meeting the diverse needs of various educational systems and student demographics, ultimately facilitating a close integration of open education and vocational education. For example, pathway C, focusing on Major and Curriculum Construction. This pathway begins with the collaborative construction of majors, ensuring the foundational establishment of the integration between open education and vocational education. This initial step aims to create a targeted disciplinary framework to meet the learning needs of students from different educational backgrounds. Subsequently, there is a focus on strengthening curriculum design, identified as a pivotal element in achieving integration,

to better amalgamate the instructional components of open education and vocational education. Simultaneously, the adoption of an innovative 'online + offline' practical training model further promotes the fusion of teaching methods, thereby enhancing students' vocational capabilities. Ultimately, the establishment of a comprehensive curriculum quality assessment mechanism and safeguard system is a crucial means to ensure the effectiveness of educational integration. By monitoring the integration outcomes of open education and vocational education, promptly identifying, and rectifying potential issues, this pathway can truly propel the effective and profound integration of open education and vocational education.



(A:Policies and Institutions B:Teachers' Development C:Major and Curriculum Construction D:Educational Resources
E:Learning Outcomes and Qualifications F: Talent Development G:Theory and Culture)

Figure 2. Proposed critical pathways to promote the integration of open education and vocational education in China

6. Conclusion

These This research meticulously sifted through and deeply analyzed a series of relevant literature, aiming to accurately grasp the challenges in integrating open education with vocational education, to comprehend the current state of this field, and to identify pathways for its advancement.

Research outcomes addressing the challenges of integrating open education with vocational education have predominantly been published in various journals, including but not limited to "Adult Education" "Journal of Liaoning Higher Vocational" "Journal of Gansu Radio & TV University" "Science Education and Culture" and "Journal of Henan Radio & TV University". "Journal of Liaoning Higher Vocational" and "Adult Education" have more research outcomes on the challenges in the integration of open education and vocational education. According to the research findings, regarding the challenges in the integration of open education with vocational education, "Journal of Liaoning Higher Vocational Education" and "Adult Education" have covered 11 and 9 research articles respectively, which is relatively higher compared to the research outcomes in other journals. Based on the summary and analysis of the challenges existing in the process of integrating open education with vocational education, it could be observed that the primary challenges were concentrated in several key areas. These challenges extended beyond changes in educational methods and the construction and integration of educational resources; they also involved the professional development of teachers, curriculum system construction, the establishment of integration mechanisms, certification and transformation of learning outcomes, improvement of evaluation mechanisms, and enhancing acceptance of integration. Based on the research findings, there are 20 articles that investigate the insufficient effectiveness in the construction and integration of educational resources. Additionally, there are 13 articles focusing on the differences in components of the education system, and another 11 articles addressing the deficiencies in integration management mechanisms. In comparison to other studies, these quantities are relatively higher. In the process of integrating open education and vocational education, the ineffective construction and integration of educational resources, differences in components of the education system and inadequate integration management mechanism face significant challenges.

The research outcomes related to pathways for promoting the integration of open education and vocational education have been predominantly published in various journals, including but not limited to "Journal of Liaoning Higher Vocational" "Journal of Liaoning TV & Radio University" "Journal of Chongqing Radio & TV University" "Adult Education" "Journal of The Open University of Guang dong" "Journal of Jiangxi Open University" "Journal of Guizhou Radio & Television University". "Journal of Liaoning Higher Vocational" and "Journal of Liaoning Radio & TV University". "Journal of Liaoning Higher Vocational" and "Journal of Liaoning Radio & TV University".

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University" demonstrate a keen interest in exploring pathways for integrating open education and vocational education. Based on the research findings, regarding the integration pathways of open education and vocational education, "Journal of Liaoning Higher Vocational" and "Journal of Liaoning TV&Radio University" have covered 62 and 59 research articles, respectively. This quantity is relatively higher, surpassing the research outcomes of other journals, highlighting their strong interest in in-depth exploration of the integration pathways between open education and vocational education. The summary and analysis of research focused on factors to develop pathways for promoting the integration of open education and vocational education revealed that "leverage modern information technology in educational integration, incorporate technical skills and craftsmanship spirit strengthen teacher training and institutional management, incentivize the enhancement of teachers' professional abilities, and promote the integrated construction and sharing of the teaching staff" and "innovate "online+ offline" practical training, enhance workplace learning culture, improve practical skills, and promote the construction and integration of practical teaching systems" have been significantly emphasized. In the context of China, proposed critical pathways for integrating open education and vocational education may encompass policies and institutions, teachers' development, major and curriculum construction, educational resources, learning outcomes and qualifications, talent development, and theory. Based on the research findings, articles related to effective measures for promoting the integration of open education and vocational education, specifically focusing on teacher development, as well as major and curriculum construction, reached 233 and 157, respectively. It's worth noting that some articles address multiple aspects concurrently. In comparison to other factors promoting the integration of open education and vocational education, research in the areas of teacher development and major and curriculum construction receives more attention. The data suggests a growing emphasis on these aspects, and future trends indicate that they may emerge as the primary pathways in studying the integration of open education and vocational education.

6.1. Implication of the study

The integration of open education and vocational education, as a popular area of education research, has long received the attention and attention of researchers. Currently, there is a notable

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absence of systematic analysis regarding the challenges and pathways involved in the integration of open education and vocational education over the past decade. Furthermore, the proposed approach focuses predominantly on measures rather than incorporating the utilization of the Critical Path Method (CPM) to define critical pathways. This study strengthens existing literature and proposes critical pathways for the integration of open education and vocational education through a systematic approach not only bridges a crucial gap but also bears both theoretical and practical significance.

It can help deepen the theoretical understanding of this phenomenon, expand and improve research on open education and vocational education, and construct a more comprehensive theoretical framework within the field of educational research. The important conclusions systematically derived from the in-depth analysis of the literature in this research will contribute to providing essential guidance for future research and practice. These conclusions may offer potential insights and directions for educational policymakers, institutions, and practitioners to advance the integration of open education and vocational education. This review is also expected to play a positive role in promoting educational integration, enhancing educational quality, and cultivating students with practical application capabilities. This includes optimizing the allocation of educational resources, improving teachers' educational capabilities, innovating teaching models, fostering students' comprehensive literacy, and enhancing their competitiveness in the professional arena. Overall, it aims to propel the development of future education in China.

6.2. Limitations of the Study

However, this study has some limitations. Firstly, the choice of search terms may impact the comprehensiveness of literature retrieval, potentially excluding some relevant publications not covered by the selected terms and thereby affecting the breadth of the study. Secondly, the use of specific databases may introduce limitations in coverage, leading to a potential omission of literature relevant to the research topic. Considering the differences among various databases, the study may not encompass all possible relevant publications. Additionally, restricting the study's time frame to specific years may result in missing key studies conducted outside of this period. Despite covering

the latest research findings, there is a possibility of overlooking earlier but still significant contributions.

For future research, expanding the scope of search terms, diversifying the selection of databases, and relaxing the time constraints could provide a more comprehensive and holistic research perspective. This would ensure a more thorough coverage of relevant literature. Implementing these adjustments may alleviate some of the current study's limitations, enhancing the credibility and applicability of future research endeavors.

6.3. Recommendations for Future Research

The current research outcomes primarily lean towards the theoretical aspect, and future studies should pay more attention to how these theoretical findings can be translated into practical applications. Specifically, researchers should delve into teacher development and curriculum construction as pivotal pathways to propel the organic integration of open education and vocational education. In this process, it is essential to focus on the following aspects:

Firstly, emphasize practical application. Future research should strive to explore how theoretical findings can be applied in real educational settings. This may include formulating practical teaching methods, developing diverse online learning tools, and promoting enhanced engagement of students and practitioners in the learning process.

Secondly, focus on teacher development and curriculum construction. Gain a deeper understanding of the critical role played by teacher development and curriculum construction in integrating open education and vocational education. By training teachers to better adapt to the principles of open education and vocational education and optimizing the structure and content of the curriculum, education can be made more practical and adaptable.

Simultaneously, conduct international comparative studies. Actively draw inspiration from and absorb the best practices in open education and vocational education from different countries. Through comparing policies, education systems, and implementation strategies across nations,

valuable experiences and insights can be provided for the development of open education and vocational education in China.

Such research directions will contribute to better guiding practical educational practices and advancing the deep integration of open education and vocational education.

Acknowledgements: This paper presents the phased results of a 2022 scientific research project funded by Jiangsu Province Lifelong Education Research entitled ‘Research on the Integration Development Path of Open Education and Vocational Education from the Perspective of Symbiosis Theory’ (Project No. 22SZJC031).

Author Contributions: All authors have read and agreed to the published version of the manuscript. The first author completed the writing of the manuscript, while the other authors were responsible for reviewing and revising it."

Conflicts of Interest: No conflict of interest.

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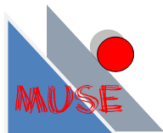
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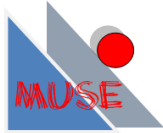
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